AllUrbanPlanning PTY LTD

Planning Submission
Housing Land Supply Act
Land at the intersection of Howard Road and Goodwood Road, Goodwood

Date October 2021

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Introduction

The following submission has been prepared by All Urban Planning Pty Ltd for Communities Tasmania in support of a housing land supply order under the *Housing Land Supply Act 2018* (HLSA). The proposed order is to rezone an area of land (the site) to the south west of the junction of Goodwood and Howard Road, Goodwood from Utilities to General Residential under the *Tasmanian Planning Scheme – Glenorchy Local Provisions Schedule (planning scheme).*

1. PART 1 – DETAILS OF THE LAND

1.1. Site information

The proposal relates to Crown land managed by the Department of Primary Industries, Parks, Water and Environment adjacent to the intersection of Goodwood and Howard Roads, Goodwood.

Address	***Certificate of Title***	***Site Area***	***Owner***
N/A	N/A	1438m^2	The Crown (DPIPWE)

Figure 1 – The land (source: Rogerson & Birch)

The land is located within the municipality of the City of Glenorchy and is subject to the *Tasmanian Planning Scheme – Glenorchy Local Provisions Schedule (planning scheme).*

The site exists as a grass mound that sits between a small cul-de-sac, providing access to the properties at 148-158 Howard Road, and the intersection of Howard Road and Goodwood Road. Goodwood Road is a category 3 road that connects the Brooker Highway with the Bowen Bridge and the East Derwent Highway. Goodwood Park is opposite the site to the east on the other side of Howard Road.

The site and the surroundings are described in the plan in Figure 1 and the photos in Figures 2 -4 below.

Figure 2 – View from the top of the mound on the site facing north east towards the intersection of Goodwood and Howard Roads. The southeastern spur of Mount Direction is visible in the distance

Figure 3 – View from the northern end of the site looking south southeast. The grass mound of the site is apparent as is the culdesec of Howard Road and the detached dwellings along Howard Road to the west (right of picture).

Figure 4 -View from the mound at the top of the site looking east towards Goodwood Park on the opposite side of Howard Road

Figure 5 - Existing Zoning (Source: theList)

As shown in Figure 5, the site is currently zoned Utilities. The land to the south within Goodwood is zoned General Residential.

1.2. Description of Housing Land Supply Order

It is proposed that the Minister make a housing supply order under the HLSA:

1. to declare the subject land housing supply land in accordance with Section 4(1); and
2. include an order in accordance with Section 6 to declare the area of land shown in the site plan in Appendix A to be zoned General Residential under the Glenorchy Local Provisions Schedule.

2. PART 2 – CONSIDERATION OF THE LAND

2.1. Government land (Section 5(1) HLSA)

The land is eligible government land pursuant to Section 5(1) of the Act in that:

- it is government land owned by the Crown and managed by the Department of Primary Industries, Parks, Water and Environment
- the land was government land on the commencement date of the HLSA 20 July 2018.

And the land is not:

- reserved land under the *Nature Conservation Act 2002*;
- managed under the *National Parks and Reserves Management Act 2002*;

- managed under the *Wellington Park Act 1993*;
- permanent timber production zone land, within the meaning of the *Forest Management Act 2013*; or
- future potential production forest land, within the meaning of the *Forestry (Rebuilding the Forest Industry) Act 2014.*

And not more than 5 years has elapsed since the commencement day of the Act, 20 July 2018.

2.2. Need for the land (Sections 5(2)a) HLSA)

Consistent with the Purpose under s.2(a) of the Homes Act 1935 there is a need for the land to be made available to enable the provision of housing assistance to eligible persons.

As at 30 June 2021, there were 646 applicants (15.6 per cent) on the Housing Register seeking accommodation in the Glenorchy LGA as the first preference. Additionally, 40.9 per cent of the Housing Register (1696 applicants) have indicated that they would reside in Glenorchy LGA as either their first of second preference. This data demonstrates the high demand for social and affordable housing in Glenorchy.

It is intended that the land will be developed to provide new social and affordable housing outcomes. This will include new home ownership opportunities consistent with Tasmania's Affordable Housing Strategy 2015-2025 and Action Plans.

2.3. Suitability of the land (Section 5(2)b) HLSA)

The land fulfills the requirements of ss.5(2)(b) of the HLSA in that it is located in close proximity to commercial and employment services of Greater Hobart as shown in Figure 6 including the following:

- 300m to the Prince of Wales Bay Marine Industrial Precinct to the southeast
- 500m to the Tasmanian Technopark to the east
- 700m to the Goodwood neighbourhood shopping centre to the south at Stradbroke Road
- 1.5km to commercial and employment services of Derwent Park to the south
- 2km to the Glenorchy CBD to the south west
- 7km to CBD of Hobart.

Figure 6 - Proximity to Commercial and Employment Services

2.4. Accessibility to Public Transport (Section 5(2)b) HLSA)

The land has direct frontage to the Metro, public transport bus routes 530 on Goodwood Road and Routes 560 and 561 that run through Goodwood. Bus stop Nos. 4043 and 30 are each located within 100m of the site and provide convenient transport to the Glenorchy CBD. See Figure 7 below.

Figure 7 - The site is located on Metro bus routes 530, 560 and 561 (Source: theList)

2.5. Owners Consent (Section 5(3) & (4) HLSA)

The submission is accompanied by the following consents in Appendix B:

- Secretary for the Department of Primary Industries, Parks, Water and Environment
- Minister for Crown Land

Consent from the Director of Housing also accompanies the submission in Appendix B.

2.6. The proposal is consistent with State Policies and the Southern Tasmania Regional Land Use Strategy (Section 6(1)a) HLSA)

The proposed zoning is considered consistent with State Policies and the relevant Regional Land Use Strategy as set out in the following sections:

2.6.1. State Policies

The following State Policies are made under the State Policies and Projects Act 1993:

- State Policy on the Protection of Agricultural Land 2009;
- State Policy on Water Quality Management 1997; and
- Tasmanian State Coastal Policy 1996.

The National Environmental Protection Measures are automatically adopted as State Policies under the State Policies and Projects Act 1993.

The following section examines the State Policies as they apply to this proposal.

2.6.2. State Policy on the Protection of Agricultural Land 2009

The purpose of the State Policy on the Protection of Agricultural Land 2009 is:

> *"to conserve and protect agricultural land so that it remains available for the sustainable development of agriculture, recognising the particular importance of prime agricultural land".*

Comment

The proposal does not involve agricultural land and does not conflict with this Policy.

2.6.3. State Coastal Policy 1996

The State Coastal Policy 1996 is created under the State Policies and Projects Act 1993.

Comment

The Policy applies in that the site is located within the coastal zone approximately 250m of the shore of Prince of Wales Bay.

The proposed infill development within an established settlement is consistent with the desired Outcomes for *Urban and Residential Development* under the *State Coastal Policy* and in particular Outcome 2.4.2 that:

> *Urban and residential development in the coastal zone will be based on existing towns and townships. Compact and contained planned urban and residential development will be encouraged in order to avoid ribbon development and unrelated cluster developments along the coast.*

2.6.4. State Policy on Water Quality Management 1997

The State Policy on Water Quality Management is concerned with achieving 'sustainable management of Tasmania's surface water and groundwater resources by protecting or enhancing their qualities while allowing for sustainable development in accordance with the objectives of Tasmania's Resource management and Planning System'.

Comment

The zoning will allow for suitable stormwater treatment to be incorporated in future development as required by the Planning Scheme and Urban Drainage Act 2013. Such measures will ensure the long term quality of stormwater runoff is efficiently managed to protect water quality consistent with this Policy.

2.6.5. National Environment Protection Measures

The National Environmental Protection Measures relate to:

- Ambient air quality;
- Ambient marine, estuarine and fresh water quality;
- The protection of amenity in relation to noise;
- General guidelines for assessment of site contamination;
- Environmental impacts associated with hazardous wastes; and
- The re-use and recycling of used materials.

Comment

Other than consideration of the potential for land contamination and the protection of amenity in relation to noise as discussed below, the listed NEPMs do not raise specific matters that are relevant to the proposed zoning.

Potential for land contamination

The Department of Communities engaged Geo Environmental Solutions to prepare an Environmental Site Assessment to assess the potential for contamination on this mounded site that appears likely to include some fill. There are also a number of potentially contaminating activities in the vicinity of the site including underground storage tanks at the Elwick Racecourse and Derwent Barracks. The report is provided in full as Attachment C and concludes that there were no exceedances to human health guidelines. Based on the assessment including soil sampling, no risk to human receptors from potential contamination have been identified.

The protection of amenity in relation to noise

The land is located adjacent to Goodwood Road which is a Category 3 State Road with a speed limit of 80km per hour. It is therefore within a *road or railway attenuation* area as defined under Clause C3.3 of the State Planning Provisions (SPPs).

Future development on the land for residential use will be subject to consideration under Clause C3.6.1 of the Road and Railway Assets Code of the SPPs and in particular Clause C3.6.1 *Habitable buildings for sensitive uses within a road or railway attenuation area*. It is likely that future development on the land would satisfy Acceptable Solution A1a) of this standard as a continuation of the row of residential buildings on this southern side of Goodwood Road. As shown in Figure 8 below the row of existing dwellings to the west have a consistent setback of approximately 5m from the front boundary with the road reserve.

Figure 8 - Setback of existing row of residential buildings from Goodwood Road

2.6.6. Southern Tasmania Regional Land Use Strategy

The Southern Tasmanian Regional Land Use Strategy 2010-2035 (STRLUS) addresses the relevant issues in regard to the need for new residential growth and infill across the region as well as the provision of high quality social and community facilities to meet the education, health care and needs of the community. The proposal is considered consistent with the key regional policies that deal with these matters as follows:

Residential infill

The land is located within the Urban Growth Boundary of the Southern Tasmanian Regional Land Use Strategy (STRLUS) and is surrounded by the urban residential areas of Goodwood as shown in Figure 9 below.

The Dwelling Yield Analysis that underpinned the STRLUS investigated the potential dwelling yields of existing residentially zoned land for the Greater Hobart area. The Demographic Change Advisory Council and the Residential Advisory Council of Australia indicated that over the next 25 years, an additional 30,000 houses will be required in the Greater Hobart area due to population growth. This analysis provided an indication of the capacity of the existing zoned areas to meet the required additional dwellings.

The STRLUS includes a range of policies to manage residential growth for Greater Hobart through 50% infill development and 50% greenfield development to ensure that land is released and developed to make best use of available infrastructure and at efficient densities.

The proposed rezoning would further the objective for 50% of residential growth to be met through infill development on unconstrained land.

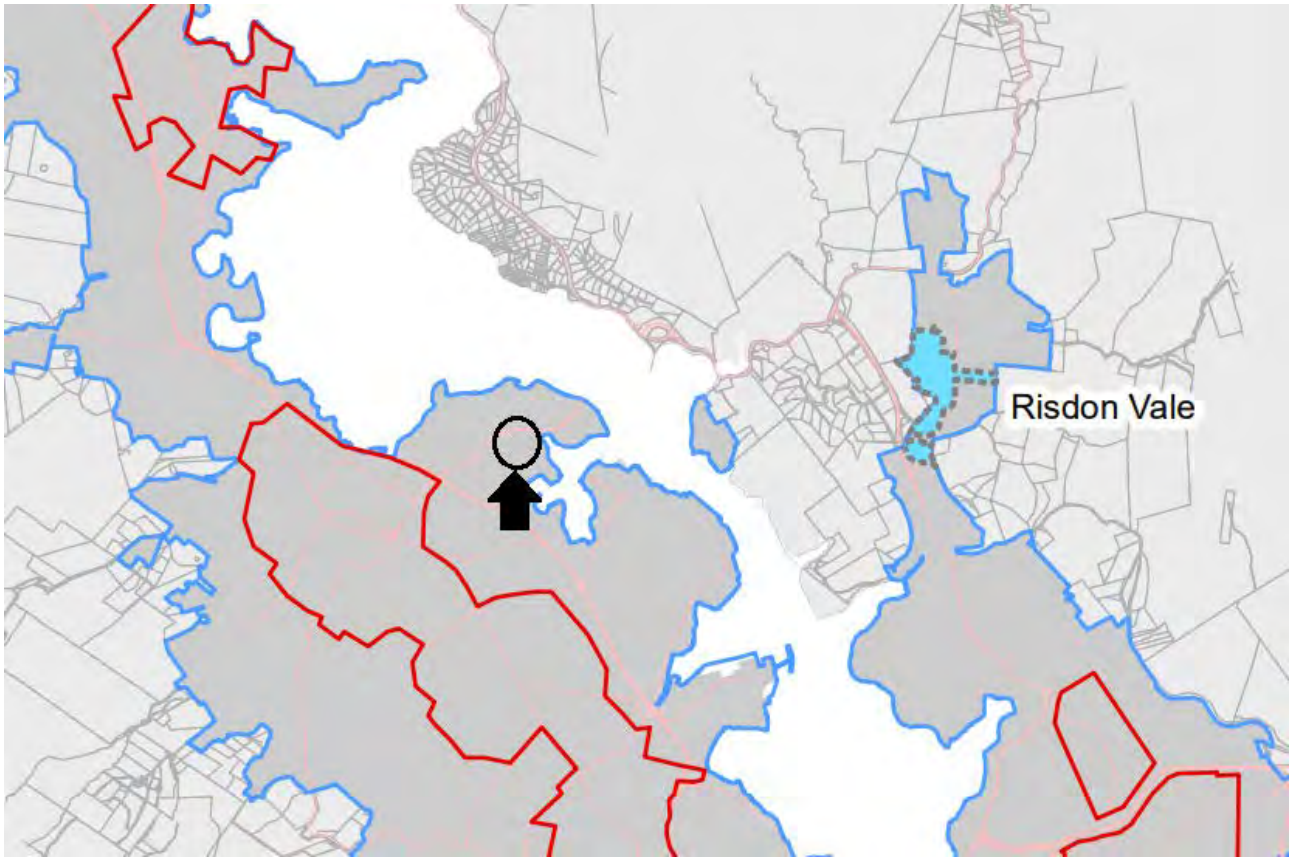


Figure 9 - Extract from Map 10 Residential Strategy for Greater Hobart, Southern Tasmania Regional Land Use Strategy 2013.

The proposal will provide for infill residential development and increased supply of affordable housing consistent with the Regional Settlement Strategy and in particular Regional Policies, SRD1.1, SRD 2.1, SRD 2.7 and SRD 2.11 of STRLUS.

Social Infrastructure

The site is in close proximity to the community services of Glenorchy within 2km of the site.

2.7. The site is not significantly restricted by any code that applies to the land –(Section 6(1)b) HLSA)

The site of the proposed zoning is not subject to any code overlay under the planning scheme. As discussed in section 2.6.5 above future development on the site is likely to be able to comply with the Acceptable Solution for sensitive uses within a road attenuation area under Clause C3.6.1, A1a of the Road and Railway Assets Code of the SPPs.

2.8. The Intended zoning would further the objectives of Schedule 1 of LUPAA (Section 6(1)c) HLSA)

The proposed zoning is considered to further the objectives of Schedule 1 of the Act as follows:

Part 1 Objectives

(a) To promote the sustainable development of natural and physical resources and the maintenance of ecological processes and genetic diversity;

Comment

The proposal promotes the objectives for sustainable development of land through allowing for the efficient use of existing urban zoned land for residential use and development within the Urban Growth Boundary under the Regional Strategy. The site relates to a cleared grass area and will not require vegetation clearing or impact on ecological processes. It is considered to further this Objective.

(b) To provide for the fair, orderly and sustainable use and development of air, land and water;

Comment

The proposal for infill development to support affordable housing outcomes on this underutilised site is considered fair, orderly and sustainable use and development and will further this objective.

(c) To encourage public involvement in resource management and planning;

Comment

Consideration of the proposal will involve notice to interested persons and the right to make submissions for consideration by the Minister before the proposed order is laid before both Houses of Parliament. The proposal will encourage public involvement consistent with the processes set out under the HLSA and will further this objective.

(d) To facilitate economic development in accordance with the objectives set out in paragraphs (a), (b) and (c) above.

Comment

As stated above, the proposal represents consolidated urban development with access to existing road, reticulated and community infrastructure. It avoids sensitive environmental areas and will facilitate affordable housing and economic development outcomes. Rezoning of the land for residential purposes allows for economic development including the construction phase of site development and by providing affordable housing options. For these reasons the proposal is considered to further this Objective.

(e) To promote sharing of responsibility for resource management and planning between the different spheres of Government, the community and industry in the State.

Comment

The proposal will be referred to interested persons for comment including Council, TasWater, Aboriginal Heritage Tasmania and as well as the Heads of relevant Agencies as required by s.11 of the HLSA. The proposal is considered to further this Objective.

2.8.1. Schedule 1 Part 2

(a) To require sound strategic planning and co-ordinated action by State and local Government;

Comment

As demonstrated throughout this assessment the proposal is consistent with the STRLUS and represents sound strategic planning that will further this Objective.

(b) To establish a system of planning instruments to be the principal way of setting objectives, policies and controls for the use, development and protection of land;

Comment

The proposal will apply a new zone under the planning scheme that will set the objectives, policies and controls for the site consistent with this Objective.

(c) To ensure the effects on the environment are considered and provide for explicit consideration of social and economic effects when decisions are made about the use and development of land;

Comment

The proposal is considered to further this Objective in that it relates to cleared urban land that will avoid significant environmental values. It will also contribute to broader social, environmental and economic benefits as a result of the proposed urban consolidation.

An environmental site assessment confirms that no risk to human receptors from potential soil contamination have been identified.

(d) To require land use and development planning and policy to be easily integrated with environmental, social, economic, conservation and resource management policies at State, regional, and municipal levels;

Comment

As discussed above the proposal will further strategic planning policies and is consistent with this Objective.

(e) To provide for the consolidation of approvals for land use or development and related matters, and to co-ordinate planning approvals with related approvals;

Comment

The proposal does not conflict with this objective.

(f) To secure a pleasant, efficient and safe working, living and recreational environment for all Tasmanians and visitors to Tasmania;

Comment

The proposal will assist in the provision of a diversity of affordable housing outcomes within close proximity to surrounding services. It furthers this objective.

(g) To conserve those buildings, areas or other places which are of scientific, aesthetics, architectural or historical interest, or otherwise of special cultural value;

Comment

There are no listed historic or cultural values on the site that would be affected by the proposal. There are a number of heritage listed places in the vicinity of the site including an existing house at 150 Howard Road opposite the site within the cul-de-sac and the Elwick Racecourse further to the west. It is considered that the development standards for the proposed General Residential zoning will ensure that the scale of future development will be compatible with the character of the area and will therefore not have an unacceptable impact on the historic cultural heritage values of these nearby places.

(h) To protect public infrastructure and other assets and enable the orderly provision and co-ordination of public utilities and other facilities for the benefit of the community;

Comment

The land is within an existing serviced area and will be referred to TasWater for comment pursuant to Section 11(c) of the HLSA. Consultation with the Department of State Growth and Glenorchy Council has confirmed that the land is not required as part of the road network. The proposal will further affordable housing outcomes for the benefit of the community consistent with this Objective.

(i) To provide a planning framework which fully considers land capability;

Comment

The proposal relates to land in an established residential area. The land is not subject to any mapped hazard overlays under the planning scheme.

It is considered appropriate for future residential use and development subject to the normal planning scheme considerations of the General Residential Zone and the provisions of the relevant Codes of the planning scheme.

2.9. The proposed zoning is consistent with the Purpose of the General Residential Zone and the section 8A guidelines of the Land Use Planning and Approvals Act (Section 6(1)d) HLSA)

The proposal to rezone the land to General Residential is consistent with the Purpose of the General Residential Zone in that:

- *To provide for residential use or development that accommodates a range of dwelling types where full infrastructure services are available or can be provided.*
- *To provide for the efficient utilisation of available social, transport and other service infrastructure.*
- *To provide for non-residential use that:*
    - *primarily serves the local community; and*
    - *does not cause an unreasonable loss of amenity through scale, intensity, noise, activity outside of business hours, traffic generation and movement, or other off site impacts.*
- *To provide for Visitor Accommodation that is compatible with residential character.*

The proposal is assessed against the Section 8A Zone Application Guidelines of the Local Provisions Schedule of the Tasmanian Planning Scheme as follows:

GRZ 1 The General Residential Zone should be applied to the main urban residential areas within each municipal area which:

(a) are not targeted for higher densities (see Inner Residential Zone); and

(b) are connected, or intended to be connected, to a reticulated water supply service and a reticulated sewerage system.

Assessment

Reticulated water, sewer and storm water services are available to the site.

GRZ 2 The General Residential Zone may be applied to green-field, brown-field or grey-field areas that have been identified for future urban residential use and development if:

(a) within the General Residential Zone in an interim planning scheme;

(b) within an equivalent zone under a section 29 planning scheme; or

(c) justified in accordance with the relevant regional land use strategy, or supported by more detailed local strategic analysis consistent with the relevant regional land use strategy and endorsed by the relevant council; and

(d) is currently connected, or the intention is for the future lots to be connected, to a reticulated water supply service and a reticulated sewerage system,

Assessment

The existing vacant land zoned Utilities is surplus to the needs of the transport network and is best described as a greyfield site under the STRLUS meaning an u*nderutilised, derelict or vacant residential or commercial site in an urban environment that are not contaminated.*[1]

The proposal will provide for infill residential development and increased supply of affordable housing consistent with the Regional Settlement Strategy and in particular Regional Policies, SRD1.1, SRD 2.1, SRD 2.7 and SRD 2.11 of STRLUS.

GRZ 3 The General Residential Zone should not be applied to land that is highly constrained by hazards, natural values (i.e. threatened vegetation communities) or other impediments to developing the land consistent with the zone purpose of the General Residential Zone, except where those issues have been taken into account and appropriate management put into place during the rezoning process

Assessment

Reticulated water and sewer are available to service the site. As discussed above, the site is not subject to any mapped hazard overlays under the planning scheme.

2.10. Consideration of any environmental, economic and social impacts (Section 6(1)e) HLSA)

The intended General Residential Zone would not prevent consideration of environmental impacts on the land as required under the Planning Scheme.

[1] Glossary, P102 of the Southern Tasmania Regional Land Use Strategy 2010-2035.

The rezoning of the land will allow for residential development which would facilitate affordable housing and associated economic development including an increase in housing stock.

Positive social impacts from the proposal include an increase in the supply of affordable residential land, which contributes to avoiding homelessness and housing stress. The General Residential Zone includes high standards of development and residential amenity.

The proposal will further objectives for urban consolidation and affordable housing that will contribute to broader social, environmental and economic benefits consistent with this requirement.

2.11. Consideration of the effect on Aboriginal and cultural heritage (Section 6(1)e) HLSA)

The proposal relates to vacant land in an established urban area. It will be referred to Aboriginal Heritage Council for comment pursuant to ss.11(g) of the HLSA.

2.12. Consideration of land use conflict on the site and on land adjacent to the site (Section 6(1)f) HLSA)

The proposed rezoning is consistent with the existing General Residential zoning surrounding the site.

There are no industrial or other uses with the potential to cause environmental harm in the vicinity of the site.

The site is adjacent to Goodwood Road which connects with the Bowen Bridge and Brooker Highway which is a category 3 road with and 80km/h speed limit. As discussed above in section 2.6.5 future residential use on the site is likely to comply with the Acceptable Solutions of the Road and Railway Assets Code confirming that any potential noise impacts from passing traffic noise will be acceptable.

2.13. Dwelling and lot density conformity to suburban density (Section 6(2)a HLSA)

The proposal will apply the provisions for the General Residential Zone under the State Planning Provisions.

2.14. Other zones intended for the site (Section 6(2)b) HLSA)

The circumstances of this land do not require the application of any other complimentary zones. It is considered appropriate that the General Residential Zone apply across the full extent of the land and that the Utilities Zone remain for the surrounding areas of road reservation.

2.15. Modified planning provisions (Section 7(1) & (2) HLSA)

It is not considered that the circumstances of this land warrant modification of a relevant housing provision.

2.16. Consultation with interested persons(Section 10 HLSA)

Interested persons (s.10 - s.12)

The interested persons in the case of this land are considered to be:

- Glenorchy City Council
- Heads of Agency that have an interest in whether or the manner in which the land ought be used and or developed including the Department of State Growth;
- TasWater;
- Tas Networks;

- the owners and occupiers of the residential properties at 146, 148, 150, 152, 154, 156, 158 Howard Road and 45 Goodwood Road, Goodwood
- Tasmania Fire Service;
- Tasmanian Heritage Council;
- Aboriginal Heritage Council

Contact details of the suggested interested persons are provided in Appendix D.

Appendix A

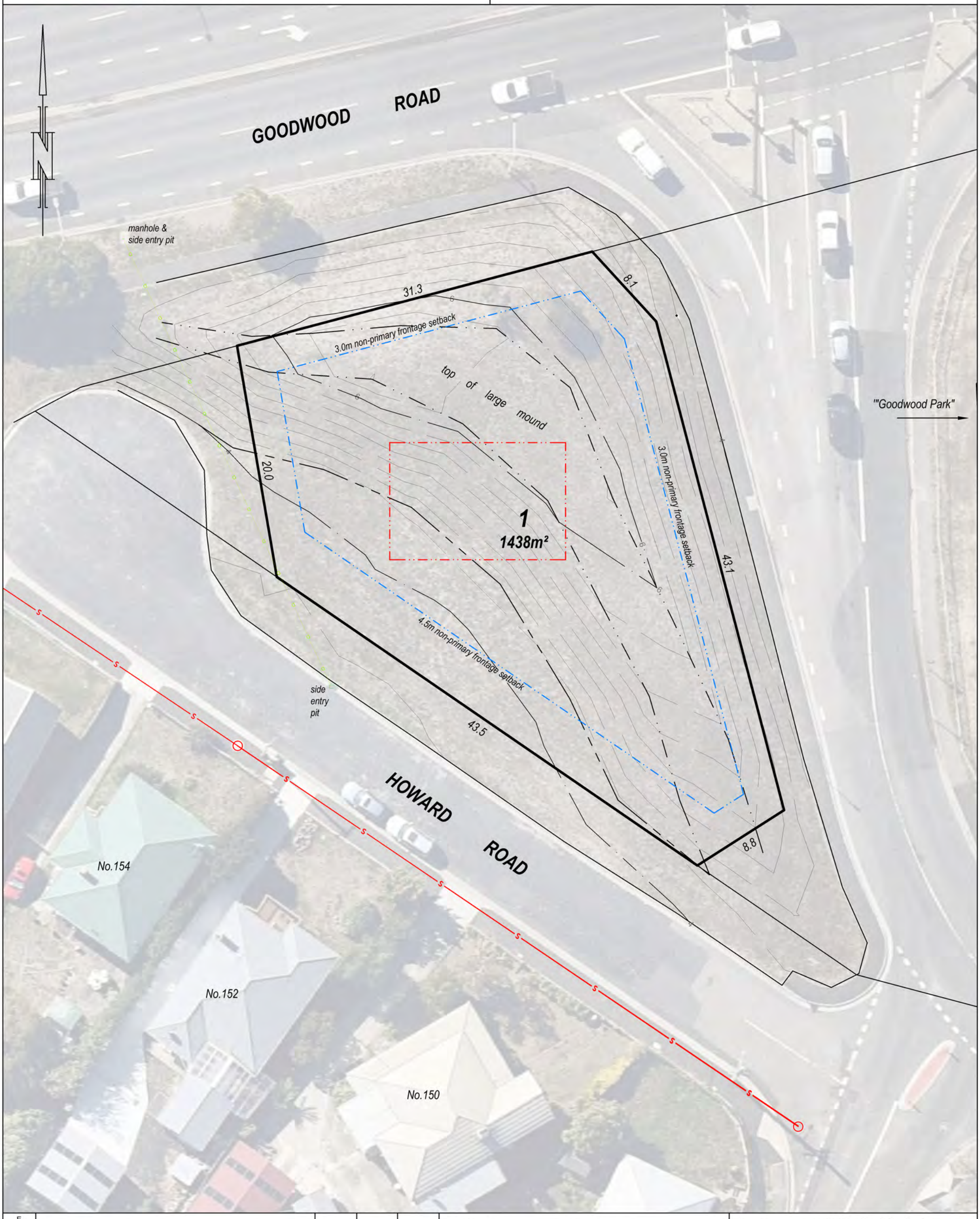
Site Plan

ROGERSON & BIRCH SURVEYORS

UNIT 1, 2 KENNEDY DRIVE
CAMBRIDGE 7170
PHONE: (03)6248 5898
EMAIL: admin@rbsurveyors.com
WEB: www.rbsurveyors.com

This plan has been prepared only for the purpose of obtaining preliminary subdivsional approval from the local authority and is subject to that approval.

All measurements and areas are subject to the final survey.



REV	AMENDMENTS	DRAWN	DATE	APPR.
E				
D				
C				
B				
A				

OWNER: The Crown
TITLE REFERENCE: n/a
LOCATION: Howard Road (near Goodwood Park)
GOODWOOD

Proposed Subdivision

Date: 4-10-2021
Reference: COTAS03 13751-01
Scale: 1:300 (A3)
Municipality: Glenorchy

Appendix B

Consents

Minister for Parks
Minister for the Prevention of Family Violence
Minister for Police, Fire and Emergency Management
Level 5, Parliament Square
4 Salamanca Place, HOBART TAS 7001 Australia
GPO BOX 123, HOBART TAS 7001
Ph: (03) 61657770
Email: minister.petrusma@dpac.tas.gov.au

Tasmanian Government

Director of Housing
GPO Box 65
HOBART TAS 7001

Consent from the Minister administering the *Crown Lands Act 1976* pursuant to s.5(3)(a) of the *Housing Land Supply Act 2018*

Pursuant to s.5(3)(a) of the *Housing Land Supply Act 2018*, as the Minister administering the *Crown Lands Act 1976*, I hereby provide consent for the land listed in the table below, to be the subject of an Order under the *Housing Land Supply Act 2018*.

Title Reference	Street Address	Suburb	Authority
CT 108441/1, CT 781001/1	William Street	Brighton	DSG
CT 62700/15	18A Lester Road	Penguin	DSG
N/A	Land at the intersection of Howard Road and Goodwood Road	Glenorchy	DPIPWE

Yours sincerely

Hon Jacquie Petrusma MP
Minister for Parks

Insert CM reference

Appendix C

Environmental Site Assessment

GES

GEO-ENVIRONMENTAL

SOLUTIONS

ENVIRONMENTAL SITE ASSESSMENT – Version 2

Corner of Goodwood Road and Howard Road, Goodwood

March 2021

For Department of Communities

Geo-Environmental Solutions P/L 29 Kirksway Place, Battery Point, 7004. Ph 6223 1839 E: Office@geosolutions.net.au

DOCUMENT CONTROL

Title	Version	Date	Author	Reviewed By
Environmental Site Assessment: Goodwood Road and Howard Road, Goodwood, Tasmania	Version 1	9th March 2021	Sarah Joyce	JP Cumming
Environmental Site Assessment: Goodwood Road and Howard Road, Goodwood, Tasmania	Version 2	31st March 2021	Sarah Joyce	JP Cumming

EXECUTIVE SUMMARY

This report presents the findings of an Environmental Site Assessment (ESA) undertaken by Geo-Environmental Solutions Pty. Ltd. (GES) on the vacant land on the corner of Goodwood Road and Howard Road, Goodwood, Tasmania. GES was commissioned by Department of Communities, to conduct the site assessment.

The Department of Communities Tasmania is proposing unit style housing development with a medium-density residential development on the site. Any potential excavation of the site will trigger the Potentially Contaminated Land Code because of the presence of fill that that has been added to the site overtime. The objective of this investigation is to confirm that any excavation of potentially contaminated land does not adversely impact on human health or the environment and is suitable for its intended use.

This ESA has been prepared by a suitably qualified and experienced practitioner in accordance with procedures and practices detailed in National Environmental Protection Measure [Assessment of Site Contamination] (NEPM ASC; 2013).

The following information was gathered during the desktop investigation:

- The site is zoned *Utility* but is proposed to be rezoned as *General Residential* under the *Glenorchy City Councils Interim Planning Scheme of 2015.*
- The geology of the site is man-made sediments of sand and clays derived from most like basalt and dolerite weathered soils from the Goodwood Road upgrade.
- An EPA Tasmanian search confirmed that historical underground petroleum storage system (UPSS) was present at both Elwick Racecourse & Derwent Barracks. The current investigation confirmed no soil hydrocarbon impact was detected.
- The EPA also confirmed that there was an active UPSS at Linen Services Tasmania at 34-36 Negara Crescent, Goodwood in 2011. GES have been ruled out as the property as potentially impacting the site as it is 250m down gradient from the site.
- WorkSafe Tasmania (WST) confirmed that the following records management system held no information for the site: the EPA's Environmentally Relevant Land Use Register (ERLUR) and the WST Dangerous Substances database.
- Historical aerial photograph review revealed that the site was sandy mudflats almost beach like in appearance in 1957, since then the area has been slowly infilled. It has never house potentially contaminating activities except for the acquisition of uncontrolled fill over time.
- Groundwater is inferred to be converging on the site and then the water migrates east towards Prince of Wales Bay, where it enters the bay 250m from the site; the bay is part of the River Derwent.
- There is the potential for Acid Sulfate Soils (ASS) to be present at the site due to the proximity to the waters of the River Derwent, however for the following reasons ASS is ruled out; 1) field pH was above 5; 2) there was no evidence of water logging or associated odour and 3) there was no blue gley staining of material.
- Potentially contaminating activities in the vicinity of the site include uncontrolled fill, fallout from operating highway, former underground fuel storage and proximity to the zinc works.
- Contaminants Of Potential Concern (COPC) include the following: TPH/TRH; Mono Aromatic hydrocarbons: (BTEXN); PAH; and heavy metals and / or Asbestos.

From the soil assessment, it is concluded that:

- No asbestos fibres or sheeting were identified in the fill on site and therefore the presence of asbestos has been ruled out.
- No visual evidence of water logging or aromatic evidence of a reduced oxygen environment which may have indicated the presence of Acid Sulfate Soils or detection from the field pH testing as pH values ranged 5.6 to 7.4. Therefore, the presence of ASS has been ruled out.

- Human Health: There were no human health guideline exceedances for dermal contact or for dust inhalation and soil ingestion. There were no indoor vapour risks or trench worker vapour risks identified. Therefore, no risk to human receptors from potential soil contamination have been identified.
- Environment: The River Derwent has been identified as an ecological receptor. There were three EIL exceedance for zinc in material at BH01 and BH03 soil bore locations.
- Excavated Soil Management: In terms of *IB105*; 8 of the 10 primary soil samples, are considered Level 2 Material (Low Level Contaminated Soil) due to elevated levels of chromium, manganese, nickel, and zinc.

The following conclusions and recommendations were made:

There were no exceedances to human health guidelines. Based on the current assessment no risk to human receptors from potential soil contamination have been identified.

There were ecological exceedances identified at the site and every effort possible should be made to minimise sediment runoff from the site into the River Derwent. GES recommends the following protection measures:

- A Soil and Water Management Plan (SWMP) should be written and implemented prior to any earthworks being undertaken on the site.
- All contractors working on site should be made aware of this plan.

GES recommends the following:

- In terms of soil disposal, the soil in the areas tested on site is classified as Level 2 Material. Any excavated material for offsite must be managed in accordance with the EPA Tasmanians *IB105* and the controlled waste transport regulations.

Statement of Suitability

Based on the current results of the Environmental Site Assessment, providing the recommended protection measures are put in place then the planned excavation works will not adversely impact on human health or the environment. No further remediation and/or protection measures are required.

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Plates

Figures

Tables

ABREVIATIONS

AEC	Areas of Environmental Concern
AHD	Australian Height Datum
ALS	Analytical Laboratory Services
ANZECC	Australia and New Zealand Environment and Conservation Council
BGS	Below Ground Surface
BH	Borehole
BTEXN	Benzene Toluene Ethylbenzene Xylene Naphthalene
COA	Certificate of Analysis
COC	Chain of Custody
COPC	Contaminant of Potential Concern
CRC CARE	Corporative Research Centre for Contamination Assessment and Remediation of the Environment
CSM	Conceptual Site Model
DQO	Data Quality Objectives
EOH	End Of Hole
EIL	Ecological Investigation Levels
ESL	Ecological Screening Levels
EPA	Environmental Protection Authority
ESA	Environmental Site Assessment
GDA94	Geocentric Datum of Australia 1994
GES	Geo-Environmental Solutions Pty. Ltd.
HIL	Health Investigation Levels
HSL	Health Screening Levels
IL	Investigation Levels
LOR	Limits of Reporting
MDL	Mean Detection Limit
NATA	National Association of Testing Authorities
NEPM ASC	National Environmental Protection (Assessment of Site Contamination) Measure
NHMRC	National Health and Medical Research Council
NL	Non Limiting
NRMMC	Natural Resource Management Ministerial Council
PAH	Polynuclear Aromatic Hydrocarbons
PCP	Physico-Chemical Parameters
PHC	Petroleum Hydrocarbons
PID	Photo-Ionisation Detector
PPA	Preferential (PVI) Pathways Assessment
PVI	Petroleum Vapour Intrusion
TPH	Total Petroleum Hydrocarbons
TRH	Total Recoverable Hydrocarbons
USCS	Unified Soil Classification System

1 INTRODUCTION

1.1 General

This report presents the findings of an Environmental Site Assessment (ESA) undertaken by Geo-Environmental Solutions Pty. Ltd. (GES) on the vacant land on the corner of Goodwood Road and Howard Road, Goodwood, Tasmania. GES was commissioned by Department of Communities, to conduct the site assessment.

The Department of Communities Tasmania is proposing unit style housing development with a medium-density residential development on the site. Any potential excavation of the site will trigger the Potentially Contaminated Land Code because of the presence of fill that that has been added to the site overtime. The objective of this investigation is to confirm that any excavation of potentially contaminated land does not adversely impact on human health or the environment and is suitable for its intended use.

This ESA has been prepared by a suitably qualified and experience practitioner in accordance with procedures and practices detailed in National Environmental Protection Measure [Assessment of Site Contamination] (NEPM ASC; 2013) guidelines and key regulations and policies identified in the References section of this document. Personnel engaged in preparing this ESA are listed in Appendix 1 along with their relevant qualifications and years of experience.

Figure 1 Site Location (Image C/O The LIST)

1.2 Site Layout

An aerial image of the existing site layout is presented in Figure 2.

Figure 2 Existing Site Layout (Image C/O The LIST)

1.3 Site Details

Site details are presented in Table 1.

Table 1 Site Details

SITE LOCATION: Goodwood Road and Howard Road, Goodwood, Tasmania
INVESTIGATION AREA The investigation area is the vacant land east of the Howard Road cul-de-sac vehicle turning area.
SITE ELEVATION & GRADIENT Approximately 4m ASL, with slight fall to the east
SITE SURFACING The site surface in the investigation area is grass and typical of cleared vacant land adjacent to a major road.
TITLE REFERENCES Information not available.
SITE OWNER Crown Land
PREVIOUS LANDUSE Vacant Land and Reclaimed land; originally mud flats
SITE SURROUNDING LAND ZONING *Glenorchy Interim Planning Scheme 2015 – Utility to be rezoned General Residential*
SITE LAND USE Vacant Land adjacent to Goodwood Road, the major road that connected Goodwood to Old Beach and Rison Vale via the Bowen Bridge.
PROPOSED LAND USE Residential Dwelling

1.4 Investigation Objectives

The objective of this ESA was to investigate the site for contamination and to ensure the excavation of potentially contaminated land does not adversely impact on human health or the environment and is suitable for its intended use.

1.5 Scope of Works

The scope of work for this ESA was to:

- Conduct a desktop and an invasive soil investigation at the site.
- Drill five (5) soil bores and collect ten (10) primary soil samples.
- The samples were sent for analysis of total recoverable hydrocarbons (TRH) Benzene Toluene Ethylbenzene Xylene Naphthalene (BTEXN), Polynuclear Aromatic Hydrocarbons (PAH), and a suite of fifteen (15) metals plus pH was testing in a select number of samples.
- Samples were sent to a National Association of Testing Authorities (NATA) accredited laboratory.
- Samples were sent with quality assurance/ quality control (QA/QC) samples including one rinsate blank and one duplicate split sample.
- Determine the absence or presence and if present the level of site contamination and compare soil results against the relevant guidelines.
- Conduct a risk assessment, known as a Conceptual Site Model; and
- Report findings in an Environmental Site Assessment report, detailing specific onsite human health or environmental risk which may source from potentially detected contamination.

2 PLANNING

2.1 Overview

The Department of Communities is proposing unit style housing development with a medium-density residential development on the site. Any potential excavation of the site will trigger the Potentially Contaminated Land Code because of the presence of fill that that has been added to the site overtime. The objective of this investigation is to confirm that any excavation of potentially contaminated land does not adversely impact on human health or the environment and is suitable for its intended use.

2.2 Permit

Currently there is no planning permit for the proposed development. However, in anticipation of excavation work greater than $1m^2$, the following has been considered

2.2.1 PCL1

Confirmation that no more than $1m^2$ of land (to any depth) is being disturbed. If more than $1m^2$ of land is being disturbed, please provide the information required under PCL2.

2.2.2 Excavation Works E2.6.2 P1

As there is proposed excavation works at the site, there are no acceptable solutions to proposed works, E2.6.2 P1 performance criteria are to be addressed. The objective of the performance criteria is to identify that the excavation works must not adversely impact on health and the environment, having regard to:

(a) an environmental site assessment that demonstrates there is no evidence the land is contaminated; or

(b) a plan to manage contamination and associated risk to human health and the environment that includes:

  i. an environmental site assessment;

  ii. any specific remediation and protection measures required to be implemented before excavation commences; and

  iii. a statement that the excavation does not adversely impact on human health or the environment.

2.2.3 Remediation and Protection Measures

If the Environmental Site Assessment report concludes that remediation and/or protection measures are necessary to avoid risks to human health or the environment, a proposed remediation and/or management plan must be submitted.

Any remediation or management plan involving soil disturbance must include a detailed soil and water management plan to prevent offsite transfer of potentially contaminated soil or stormwater.

2.2.4 Statement of Suitability

A statement based on the results of the Environmental Site Assessment that the excavation as part of the planned works will not adversely impact on human health or the environment is to be provided (subject to implementation of any identified remediation and/or protection measures as required).

3 DESKTOP STUDY

3.1 Site Zoning

The site is zoned *Utility* but is proposed to be rezoned *General Residential* under the Glenorchy City Councils Interim Planning Scheme of 2015. The land use surrounding the site is predominantly *General Residential, Community Purpose, Recreation and Utilities*, see Figure 3. The site is therefore to be assessed against land use Class A for low density Residential land use and Recreational land use.

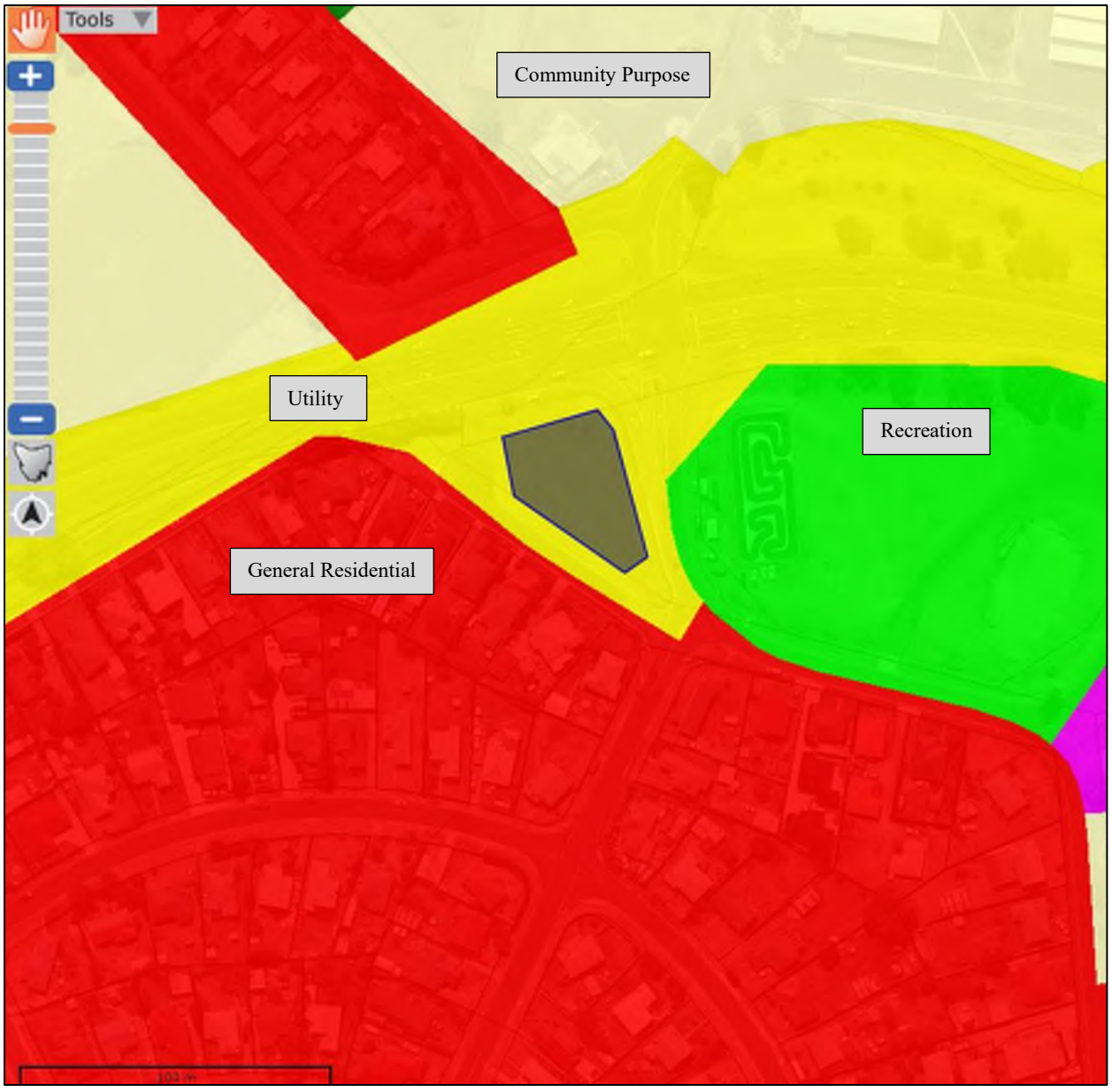

Figure 3 Glenorchy City Councils Interim Planning Scheme Zones (2015)

3.2 Site Walkover

A site walkover was completed by GES staff on the 24th February 2021. No obvious signs of contamination such as staining, or odour plus asbestos fibres were observed. Images are presented in Appendix 2.

3.3 MRT Geology Mapping

The geology of the site has been mapped by Mineral Resources Tasmania, see Figure 4. The site is inferred to be underlain with man-made deposits over Quaternary sediments. The surrounding area is a mix of Jurassic dolerite and Cainozoic basalt.

Geological descriptions follow:

Qhmm *– man made deposits over Quaternary sediments*
Tbr - *Cenozoic cover sequences – Transitional olivine basalt.*
Tbi - *Inferred basalt beneath soil or Cainozoic deposits.*
Jd *– Jurassic dolerite and related rocks*

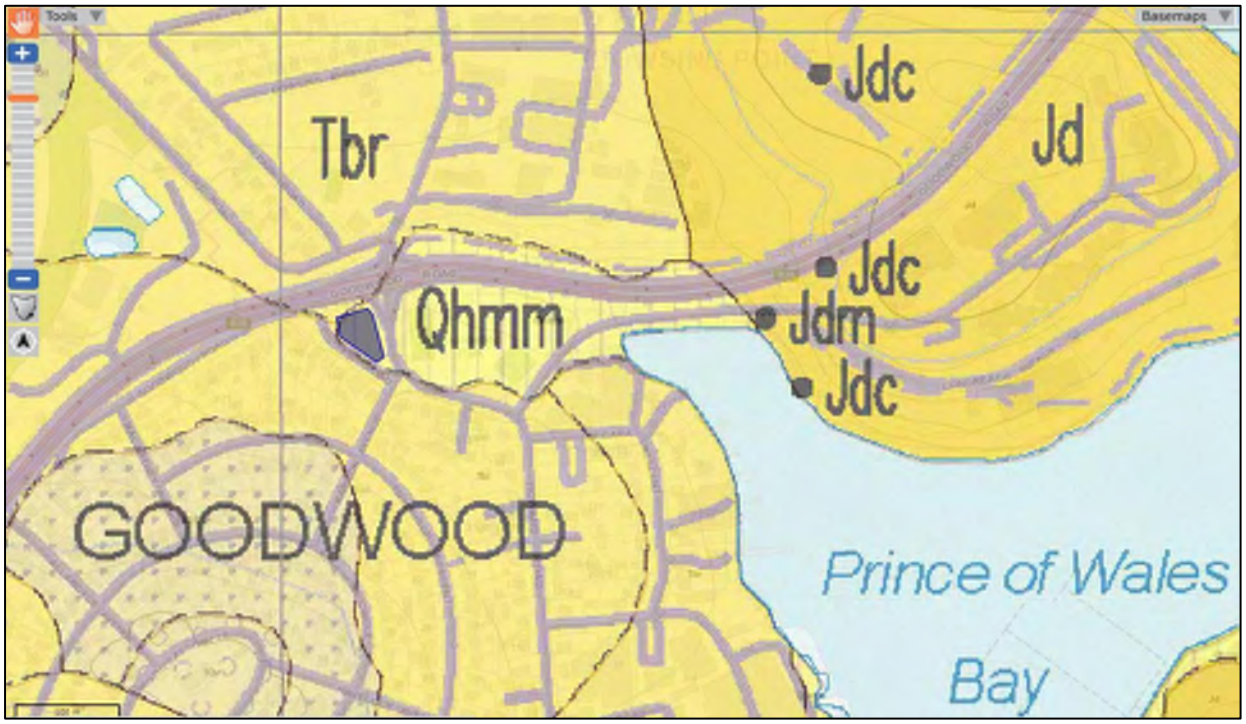

Figure 4 Mineral Resources Tasmania 1:25000 Scale Mapping (The LIST).

3.4 EPA Tasmania

An EPA Archive and Document Search form was submitted on the 16th February 2021 to Environmental Protection Authority (EPA) Tasmania. Due to time constraints the original report was finalised prior to receiving the search results. The search results were provided to GES on the 22 March 2021 and is included in Appendix 3 of this report. The finding from the EPA included the following:

- **2B Goodwood Road, Dowsing Point; Derwent Barracks** – in 2000 the EPA were advised of a diesel spill from a leaking fuel line with contaminated soil being removed to Port Latter, in 2001 an underground petroleum storage system (UPSS) was found to be leaking and removed, 2007 additional contaminated soil was removed and in 2014 decommissioned tanks were removed.
- **34-36 Negara Crescent, Goodwood,** Linen Services Tasmania had an active 5000L tank in January 2011
- **2-6 Goodwood Road Elwick Racecourse;** in October 2011, an abandoned UPSS was decommissioned.

The data available on the EPA Tasmania Regulated Premises layer on The LIST has been consulted. It shows the following information regarding under UPSS; as illustrated in Figure 5:

- Active: Linen Services Tasmania; 36 Negara Crescent, Goodwood 250m east of the site, similar elevation, potential impact unlikely due to the tidal fluctuations of the River Derwent at this location.
- Abandonded: Elwick Racecourse; 2-6 Goodwood Road, 500m west of the site, potentially contaminated water may impact the site.
- Permanently Decommissioned: Derwent Barracks – 2B Goodwood Road, Dowsing Point 300m north from the site; potentially contaminated water may impact the site.

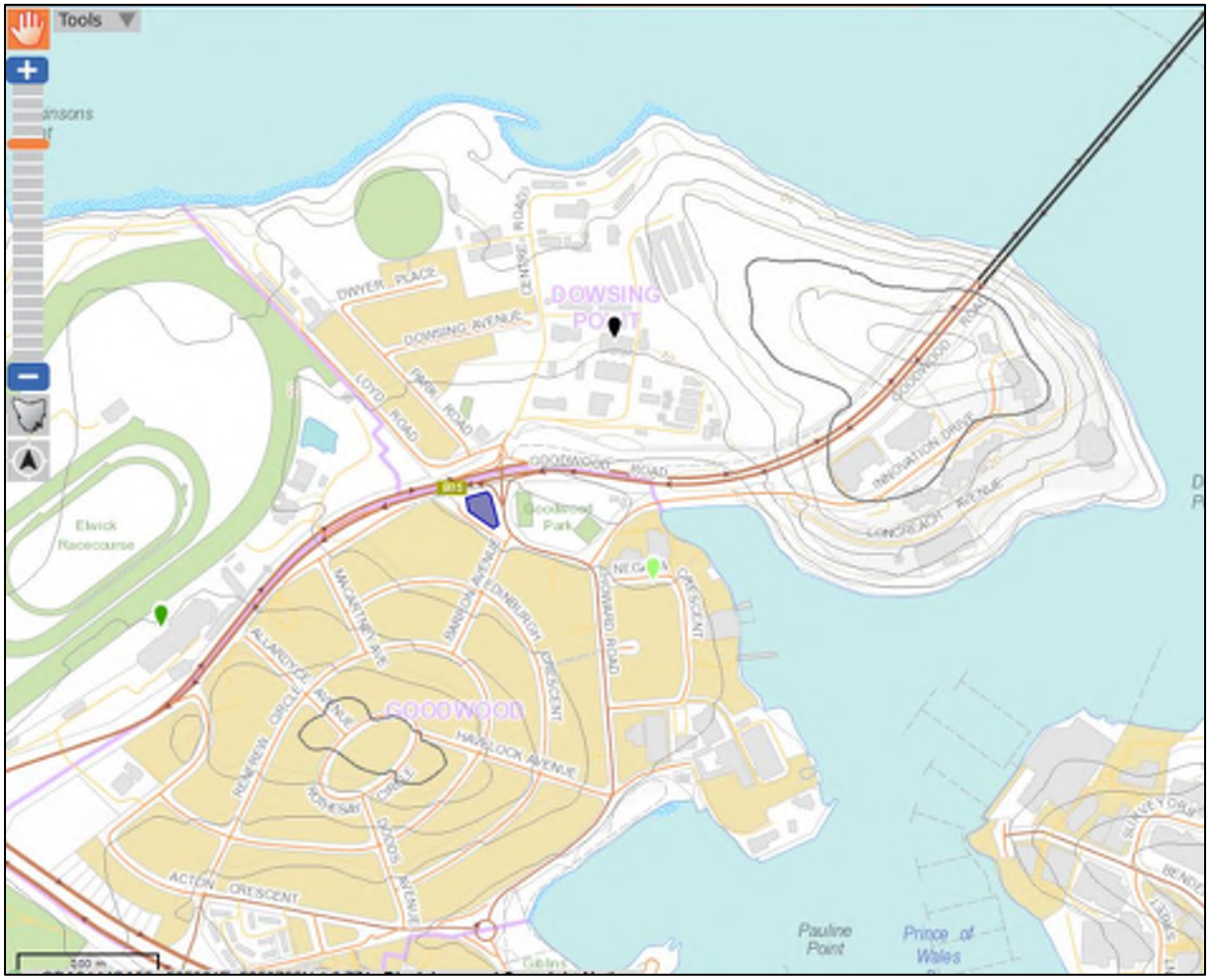

Figure 5 EPA Regulated Premises and UPSS (Source The LIST)

3.5 WorkSafe Tasmania Dangerous Goods Files

Even though the site has been a vacant block of land since it was infilled in the 1960s, WorkSafe Tasmanian (WST) was contacted. WST confirmed on the 22nd March 2021 that the following records management system held no information for the site: the EPA's Environmentally Relevant Land Use Register (ERLUR) and the WST Dangerous Substances database.

3.6 Historical Aerial Photography Interpretation

Historical aerial photographs of the site and surrounding areas were provided by the Department of Primary Industries, Parks, Water and Environment (DPIPWE) and Google Earth. The individual aerial photos are presented in Appendix 4. In summary:

- In 1957 the site was sandy mudflats almost beach like in appearance which provided a path for drainage to enter Prince of Wales Bay. Howard road cul-de-sac was the main through foreshore road
- By 1973 the site had been filled and the land where Goodwood Park is located was created. Howard Road remained the main access road.
- By 1992 Howard Road cul-de-sac had been created as well as a more formal Goodwood Road, and Innovation Drive. The earth mound on the investigation area had been created.
- Little has changed on the site since 1992, except for the removal of three small shrubs.

There are no obvious signs of contaminating activities observed in historical aerial photographs.

Table 2 Historical Photograph Log

Year	Photograph Reference
2019	Plate 1 Historical Aerial Photograph, 12 April 2019 (C/O Google Earth)
2015	Plate 2 Historical Aerial Photograph, 12 June 2015 (C/O Google Earth)
2003	Plate 3 Historical Aerial Photograph, 14 October 2003, (C/O Google Earth)
1992	Plate 4 Historical Aerial Photograph, 1992 The Site and surrounding land (c/o DPIPWE)
1973	Plate 5 Historical Aerial Photograph, 1973 The Site and surrounding suburbs (c/o DPIPWE)
1857	Plate 6 Historical Aerial Photograph, 1957 The Site and surrounding land (c/o DPIPWE)

3.7 Site Topography, Drainage & Hydrogeology

The site sits at approximately 4m above sea level (ASL) and is gently sloping to the southeast. The surface topography and inferred groundwater is illustrated in Figure 6. Based on broad scale topographic trends, groundwater and surface water is inferred to be converging on the site. The waters migrate east towards Prince of Wales Bay, and enter the bay 250m from the site; the a bay is part of the River Derwent.

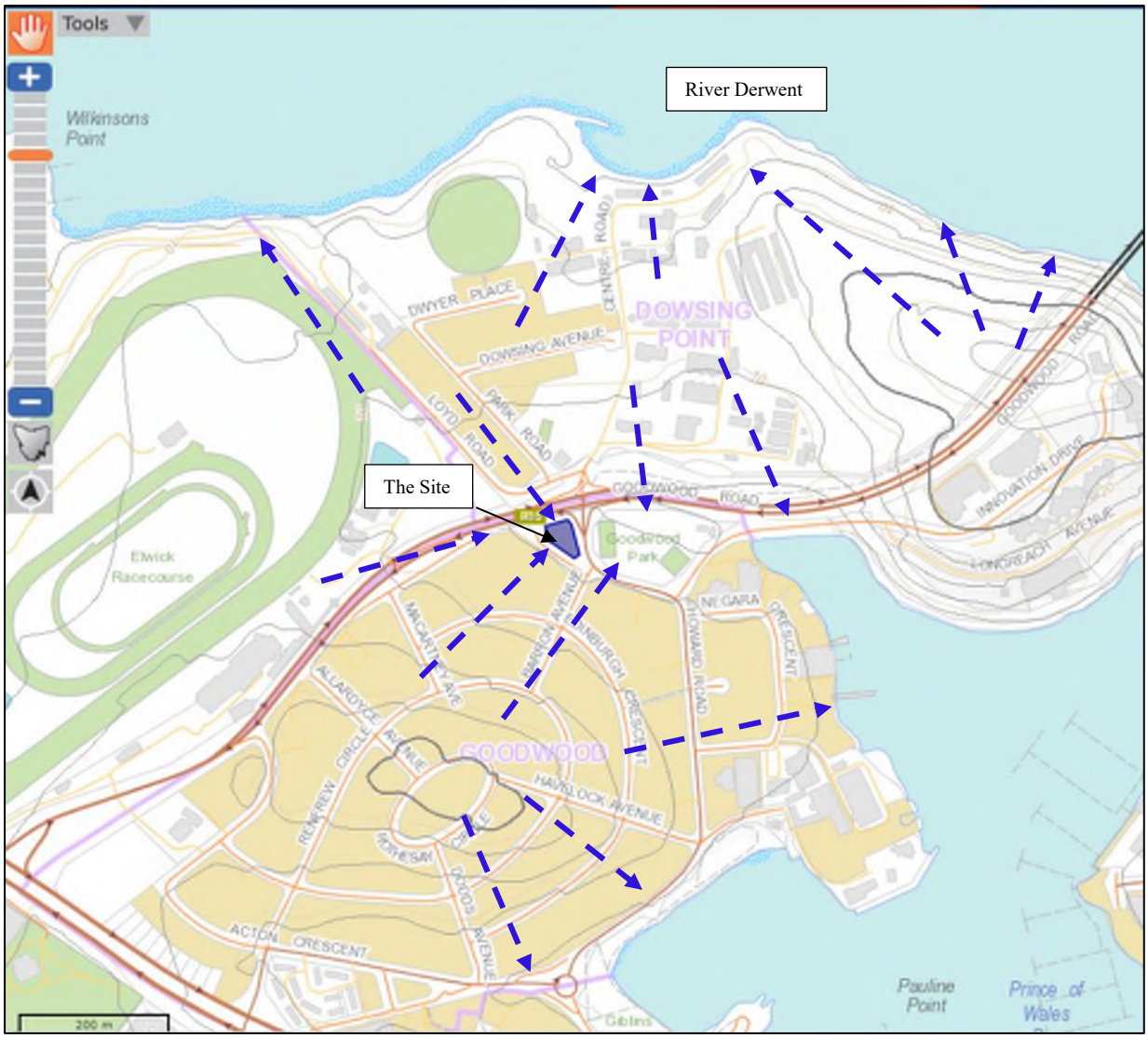

Figure 6 Contour Elevations and Inferred Surface and Groundwater Flow Direction

3.8 Groundwater

3.8.1 Potential Up-Gradient Contamination Sources

The following up-gradient sources have been considered as potential sources of contamination but discounted:

- Abandonded underground tank at Elwick Racecourse at 2-6 Goodwood Road,
- Permanently Decommissioned: Derwent Barracks at 2B Goodwood Road, Dowsing Point
- General rainfall runoff maybe channelled towards the site if not intercepted by stormwater infrastructure.

3.8.2 Downgradient Ecosystem Receptors

The closest ecological receptor is the River Derwent at Prince of Wales Bay, approximately 0.25 km east of the site.

3.8.3 Acid sulfate soils

According to the Land Information Service Tasmania (LIST) database, thought there are patches of acid sulfate soils (ASS) near to the site the site is not mapped to poses ASS; thus there is a low probability of acid sulfate soils being present at the site.

No signs of water logging during the site visit which would indicate ASS.

Figure 7 Acid Sulfate Soils Mapping (C/O the LIST)

Orange- Low (Costal Acid Sulfate Soils (0-20m AHD): Low probability of occurance (6-70% chance of occurrence in mapping unit). Disturbed ASS terrain, ASS material present below urban development, or present in former tidal zones inside bund walls e.g dredge spoil etc. Potential acid sulfate soil (PASS) = sulfidic material (Isbell 1996 p.122). No necessary analytical data are available but confidence is fair, based on a knowledge of similar soils in similar environments.

Dark Blue – High (Subtidal)- (Marine Subaqueous / Intertidal Acid Sulfate Soil): Marine Subaqueous / Intertidal Acid Sulfate Soil : High probability of occurance (>70% chance of occurrence in mapping unit). Subaqueous material in subtidal wetland, PASS material and/or MBO. Often seagrasses. Potential acid sulfate soil (PASS) = sulfidic material (Isbell 1996 p.122). Analytical data are incomplete but are sufficient to classify the soil with a reasonable degree of confidence.

3.9 Potential Contamination Issues

3.9.1 Areas of Potential Concern

The entire site is considered an area of potential concern due to the following potential contamination influences.

- Fill from the reclaimed land process.
- Exhaust fumes and general road run off from the road surface of Goodwood Road.
- Historical fuel leaks from underground fuel storage tanks at Elwick Racecourse & Derwent Barracks. The active UPSS at Linen Services Tasmania have been ruled out as the property is 250m down gradient from the site.
- Dust fall out from zinc works operation at NyrStar, 1.5km south east of the site.

These potential contamination pathways apply to the entire site, hence the entire site has been identified as an area of potential concern.

3.9.2 Contaminants of Potential Concern

Potential contaminants of potential concern (COPC) that have been considered include the following:

- Total Petroleum/Recoverable Hydrocarbons (TPH/TRH)
- Mono Aromatic hydrocarbons: Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene (BTEXN)
- Polynuclear Aromatic Hydrocarbons (PAHs)
- A suite of 15 Heavy Metals and
- Asbestos.

4 FIELD INVESTIGATION PROCEDURES

4.1 Works Summary

Site investigation works comprised of soil bore hand auguring which is summarised in Table 3, Figure 8. GES investigated the areas where soil excavation and soil disturbance are most likely to occur.

Table 3 Summary of Site Investigation Work Dates

Scope	Data	Lab Report	Details
Hang auger Sample collection	23rd February 2021	EM2103194	11 Primary soil samples were collected and 10 were selected for analysis from 5 bore holes 1 Duplicate sample and 1 Rinsate sample were collected.

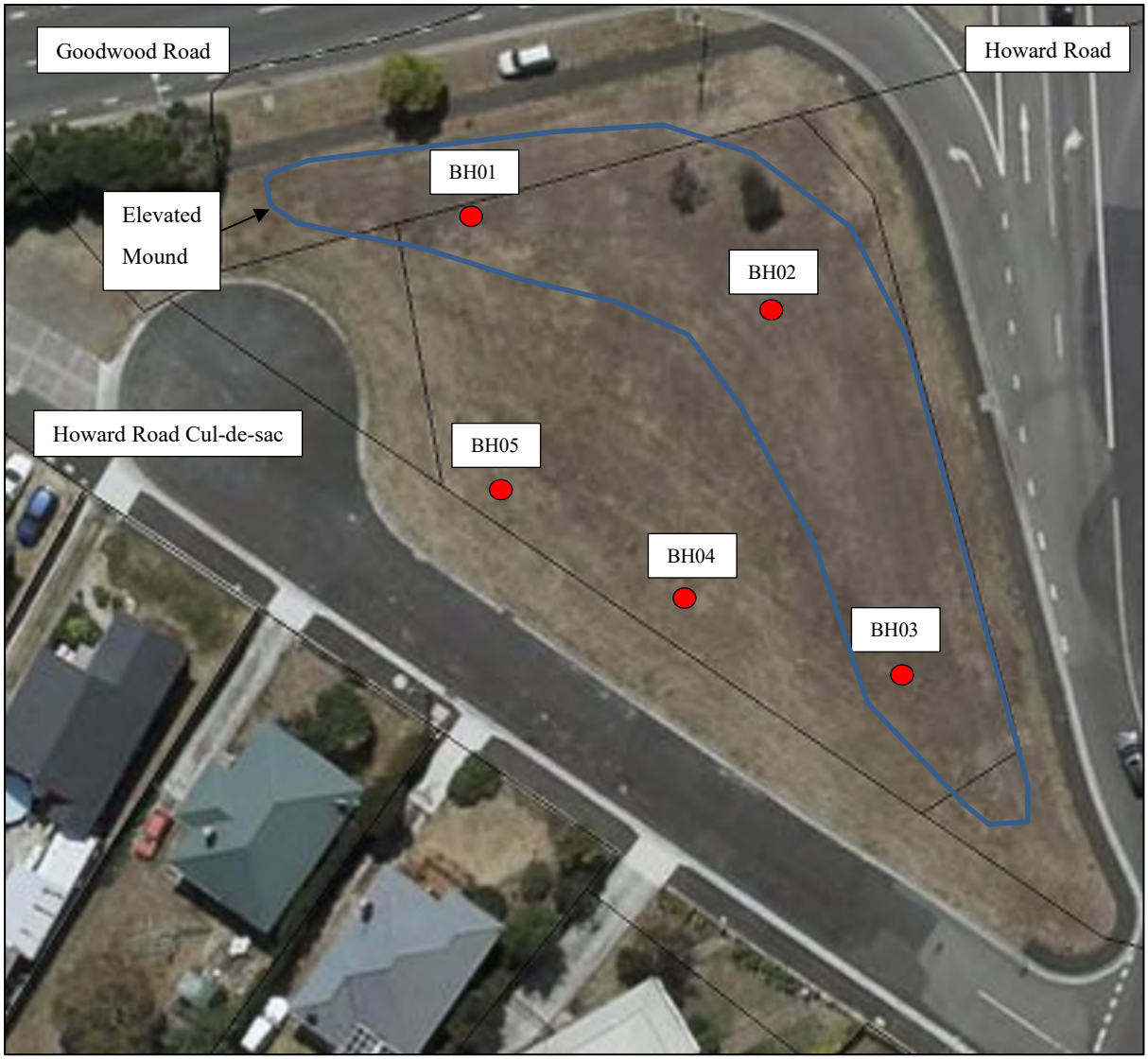

Figure 8 Borehole Plan displayed on aerial photograph

4.2 Soil Investigation

4.2.1 Borehole Drilling

A total of five (5) 65 mm diameter soil bores were hand augured for assessing site geology and sampling for contamination impact.

4.2.2 Soil Sampling

Soil sampling was conducted per the National Environmental Protection Measure (NEPM ASC 2013) and AS4482 sampling guidelines. Table 4 presents a summary of the soil assessment methodology adopted at the site.

Table 4 Summary of Soil Sampling Methods

Activity	Details / Comments
Drilling Method	Test holes were dug with a 65mm hand auger
Soil Logging	Logging the soil was conducted in accordance with the unified soil classification system (USCS) as detailed in AS1726 (1993).
Decontamination of Sampling Equipment	Quantum Clean Laboratory Detergent (R213) was used to decontaminate reusable sampling equipment (hand auger) between each borehole sampling event.
Soil Screening	In accordance with AS4482.2. Individual soil samples were collected where possible at 0.5 intervals below ground surface (bgs) and/or change in geology. Hydrocarbon odour was not discernible, and hence screening samples for volatile fractions using a Photoionisation Detector (PID) was deemed to be not necessary.
Laboratory Soil Sample Collection	In accordance with AS4482.2. All samples were collected using disposable nitrile gloves. Samples were selected for laboratory analysis at 0.2-0.3m, 0.9-1.1 and 1.5-1.6m below ground surface (bgs). A minimum number of samples were carefully selected which would provide enough information to delineate soil contamination.
Sample preservation	Soil samples were placed into a jar for laboratory analysis. Soil jars were placed in a pre-chilled cool box with ice bricks.
Sample holding times	Sample holding times were within acceptable range (based on NEPM ASC B3-2013) from collection to extraction.

4.2.3 Sample Analysis

Primary and QC samples were submitted to Analytical Laboratory Services (ALS), Springvale, Melbourne for analysis. A total of 10 samples were selected for analysis. Chain of Custody (COC) documentation was completed and is provided in Appendix 5 along with the Sample Receipt Notification (SRN) for each batch. Table 5 presents a summary of the laboratory analyses undertaken.

Table 5 Overview of Soil and Groundwater Analysis and Quality Control

Analytes	Primary Soil Samples	Duplicate Soil Samples[a]	Rinse Blank[b]
TRH	10	1	1
BTEXN	10	1	1
PAH	10	1	1
Suite 15 Metals	10	1	1
pH	5	1	-

Sampling Quality Control Standards (AS4482):
a – Duplicate and Inter-Laboratory Split samples, one (1) in twenty (20) primary samples
b– Single rinse sample per piece of equipment per day

Given metals were analysed, there was a requirement to assess the following soil physical properties to determine soil threshold investigation levels: Soil grain class (sand/silt or clay); % Clay content; Cation exchange capacity (CEC); and Soil pH. The soil physical properties were based on knowledge of similar soil types encountered around the greater Hobart area.

5 QUALITY CONTROL

All Field and laboratory Quality Assurance and Quality Control (QA/QC) details and outputs are presented in Appendix 6.

5.1 Field

It is standard to expect up to 10% error in field duplication and up to 10% laboratory error. Therefore, in theory up to 20% error can be assumed on duplicate analysis. Some variation may exist in soil and groundwater because even though all efforts are made to split samples homogeneously, fragments of materials may bias samples in certain elements.

Relative Percentage Differences (RPDs) for the duplicate and triplicate samples where applicable are calculated using the method outlined below.

The acceptance criteria used for the RPDs depend on the levels of contaminants detected and the laboratory's Method Detection Limits. The closer the levels detected are to the MDL the greater the acceptable RPD. RPDs are calculated as follows:

- RPD <50% for low level results (<20 * MDL)
- RPD <30% for medium level results (20-100 * MDL)
- RPD <15% for high level results (>100 * MDL)
- No limit applies at <2 * MDL (Method Detection Limit)

Field QA/QC procedures and compliance are summarised in Table 6.

Table 6 Soil Field QA/QC procedures and Compliance

QA/QC Requirement	Compliance	Comments
Appropriate sampling strategy used and representative samples collected	Yes	Sampling program was undertaken in accordance with AS4482.1-2005
Appropriate and well documented sample collection, handling, logging and transportation procedures.	Yes	Appropriate and well documented
Decontamination	Yes	Appropriate decontamination such as cleaning tools before sampling and between sample locations was undertaken
Chain-of-custody documentation completed	Yes	COC were completed in accordance with NEPM ASC Schedule B2, Section 5.4.5 and transported under strict COC procedures. The signed COC documents are included in this report, which includes the condition report on arrival of samples to the Laboratory, cross checking of sample identification and paperwork and preservation method.
Required number of splits: Duplicate; 1 per 20 primary samples	Yes	One duplicate sample collected and tested, for 10 primary samples analysed, as per AS4482.1-2005.
Required number of splits: inter-lab splits: 1 per 20 primary samples	No	No inter-lab split samples were collected.
QA/QC samples reported RPD's within indicated MDL guidelines.	Yes	For BH02 0.2-0.3 and Dup pairs, 98% of analytes complied.
Required numbers of rinse blank samples collected with no laboratory detections?	Yes	One rinse blank was collected, as per AS4482.1-2005.
Trip blanks collected with no laboratory detections?	NA	According to AS4482.2-1999, soil trip blanks are required where volatile hydrocarbons are discernible. This was not required.
Field blanks collected with no laboratory detections?	NA	According to Australian Standards, there is no requirement to collect field blanks, unless there is concern with cross contamination risks.
Samples delivered to the laboratory within sample holding times and with correct preservative	Yes	All samples were sent to the laboratory within holding times and correct preservative.

5.2 Laboratory

Soil laboratory QA/QC procedures and compliance are summarised in Table 7.

Table 7 Soil Laboratory QA/QC Procedures and Compliance

QA/QC Requirement	Compliance	Comments
All analyses NATA accredited	Yes	ALS Laboratories is NATA Accredited. Appropriate analytical methods used, in accordance with Schedule B(3) of the NEPM ASC 2013. Acceptable laboratory limits of reporting (LORs) adopted.
Arrival Temperature; recommended below 6^{o}C	Yes	Sample arrival temperature was recorded at 3.1^{o}C, attempt to chill was evident as it was noted that ice brick were sent in the eski with the samples.
Method Blanks: zero to <Practical Quantitation Limit (PQL)	Yes	There were no method blank value outliers in the QCI report.
Laboratory Control Samples: 70% to 130% recovery for soil.	Yes	There were no laboratory control outliers in the QCI report.
Matrix spikes: 70% to 130% recovery for organics or 80%-120% recovery for inorganics	Yes	There were no Matrix spike control outliers in the QCI report.
Duplicate Samples: 0% to <20% RPD.	Yes	There were no duplicate outliers in the QCI report.
Surrogates: 70% to 130% recovery	Yes	There were no surrogate recovery outliers in the QCI report.
Analysis holding time outliers	Yes	No hold-time outliers exist for any of the QCI reports.
Quality Control Sample Frequency Outliers	No	There were Quality Control Sample Frequency Outliers for waters for TRH Semivolatile fractions for Laboratory Duplicates and Matrix Spikes. NEPM ASC 2013 B3 & ALS QC Standard.

6 FIELD INVESTIGATION FINDINGS

6.1 Soil Bores

6.1.1 Geological Interpretation

Borehole logs are attached in Appendix 7. Our test holes yielded dry greyish brown sandy soils overlying dark brown clays of weathered basalt and or dolerite with small rock inclusions. These deposits are man made from natural materials most likely derived from Goodwood Road upgrade.

6.1.2 Grain & Depth Class Interpretation

Grain size classifications are applied to all soils at the site to determine threshold screening level concentrations for hydrocarbons (and chromium) to assess soil ecological and human health risks.

Grain class threshold values are determined based on either the:

- sample grain size (in the case of ecological screening levels or chromium limits); or
- average grain class overlying the sample point (when assessing petroleum vapour screening levels) relative to the proposed finished floor level.

Table 8 provides a summary of the grain class averages for material overlying the sample.

Table 8 Summary of Grain Class Based on USCS Classification

Sample	Footing Excavation Depth^ - Red Fill Thickness^ - Green	Sample PVI Depth (m) Relative to Slab/Cut Depth	Soil Grain Size Class Averaging Above Soil Sample																	Crawl Space Thickness (m)	Attenuation			Petroleum Vapour Intrusion HSL Grain Class*	SAMPLE USCS
			GW	GP	GM	GC	SW	SP	SM	SC	ML	CL	OL	MH	CH	OH	CI	Rock (R)	Existing Pavement (P)		Proposed CONCRETE (CH)	Crawl Space	Biodegradation		
BH01 0.2-0.3	2.0	<																		NA	0.1	1.0	1.0	CLAY	CH
BH01 0.8-0.9	2.0	<																		NA	0.1	1.0	1.0	CLAY	CH
BH01 1.5-1.6	2.0	<																		NA	0.1	1.0	1.0	CLAY	CH
BH02 0.2-0.3	2.0	<																		NA	0.1	1.0	1.0	CLAY	SW
BH02 1.0-1.2	2.0	<																		NA	0.1	1.0	1.0	CLAY	GC
BH03 0.2-0.3	1.7	<																		NA	0.1	1.0	1.0	CLAY	SW
BH03 0.8-0.9	1.7	<																		NA	0.1	1.0	1.0	CLAY	CH
BH04 0.2-0.3	0.4	0.2					0.1													NA	0.1	1.0	1.0	CLAY	CH
BH04 0.4-0.5	0.4	0.4					0.1								0.2					NA	0.1	1.0	1.0	CLAY	CH
BH05 0.2-0.3	0.4	0.2					0.1													NA	0.1	1.0	1.0	CLAY	CH

Footnotes:
* Grain class is modified based on proposed building construction: concrete is interpreted to have similar vapour intrusion properties to clay and is therefore designated as CLAY within the grain size averaging assessment; backfill is inferred to comprise of gravel (GW)
< Sample has been collected from above the proposed excavation (base of slab or proposed ground level) and is not relevant in PVI risk assessment
^ Excavation depths are approximate and may vary due to change in services depths or overall building/footing construction design

6.1.3 Soil Contamination Observations

No staining or odour consistent with hydrocarbon contamination were observed during the site visit.

7 SOIL ECOLOGICAL IMPACT ASSESSMENT

7.1 Protected Environmental Values

The requirement for protecting soil from contaminated activities in Tasmania is managed under the Environmental Management and Pollution Control Act 1994 (EMPCA) which states in Part 5A:

(2) An area of land is a contaminated site if –

(a) there is in, on or under that area of land a pollutant in a concentration that –

(i) is above the background concentration; and

(ii) is causing or is likely to be causing serious or material environmental harm or environmental nuisance, or is likely to cause serious or material environmental harm or environmental nuisance in the future if not appropriately managed.

Potential soil impact at the site is assessed through application of the following environmental investigation guidelines.

7.2 NEPM ASC (2013) Guidelines

The following ecological investigation guidelines are to be addressed to assess acceptable levels of risk to terrestrial ecosystems:

- NEPM ASC (2013) Ecological Investigation Levels (EIL's) – have been developed for selected metal and organic substances. EIL's depend on specific soil and physicochemical properties and land use scenarios and generally apply to the top two (2) metres of the soil profile (NEPM ASC 2013);
- NEPM ASC (2013) Ecological Screening Levels (ESL's) – have been developed for selected petroleum hydrocarbon compounds and total petroleum hydrocarbon fractions. ESL's broadly apply to coarse- and fine-grained soils and various land use scenarios within the top two (2) metres of the soil profile (NEPM ASC 2013).

Soil analytical results are compared against Ecological Screening Levels (ESL's) and EIL's limits presented in Table 9.

Table 9 Summary of Soil Contaminates Considered as part of this investigation, based on NEPM (2013) ASC

Investigation Levels (IL)	**Analytes Investigated**						
	Hydrocarbons				**Metals**		**DDT**
	BTEX	**TRH (F1 to F4)**	**Benzo(a) pyrene (PAH)**	**Naphthalene (PAH)**	**Zn, Cu, Cr(III), Ni & As**	**Lead**	
ESL's	Analysed	Analysed	Analysed				
EIL's				Analysed	Analysed	Analysed	Not Analysed

7.3 Guidelines

7.3.1 Ecological Screening Levels

The following compounds were compared against NEPM ASC (2013) Ecological Screening Levels (ESL's):

- BTEX
- F1 to F4 TRH and
- Benzo(a)pyrene (PAH)

Selection of ESL threshold investigation limits are set out in the NEPM ASC (2013) guidelines and require classification of the soil according to:

- Land use sensitivity:
    - Areas of ecological significance
    - Urban residential and public open space; and
    - Commercial and industrial.

- Dominant particle size passing through a 2 mm sieve into:
    - Coarse – sand sizes and greater; and
    - Fine – clay and silt sizes.

Adopted NEPM ASC (2013) soil and land use classifications are presented below.

7.3.2 Ecological Investigation Levels

The following compounds were compared against Environmental Investigation Levels:

- Lead;
- Nickel;
- Chromium;
- Zinc;
- Copper;
- Arsenic; and
- Naphthalene.

There was a requirement to classify the soil according to physicochemical properties to develop investigation limits for the above listed compounds. Adopted physicochemical parameters are presented in the results tables.

Selection of EIL threshold investigation limits are set out in the NEPM ASC (2013) guidelines and require classification of the soil per specific soil and physicochemical properties which are presented in the results tables. The adopted land use scenarios presented in Table 10.

Table 10 Adopted Land Use Scenario for the Soil Bores

Land Use Scenario	Applicable Soil Bores
Areas of Ecological Significance	
Urban Residential & Public Open Space	*All soil bores*
Commercial & Industrial	

Based on a preliminary assessment of site soil conditions, the following physicochemical properties are applied to assess guideline EIL's:

- Clay content consistent with field observations.
- A soil pH and cation exchange capacity (CEC) consistent with Table 11.

Table 11 Cation Exchange and Clay content, Adopted for the Site

USCS	Clay %	CEC	pH
R	100.00	10.00	6.0
GW	0.00	10.00	6.0
GP	0.00	10.00	6.0
GM	10.00	15.00	6.0
GC	30.00	20.00	6.0
SW	0.00	10.00	6.0
SP	0.00	10.00	6.0
SM	10.00	15.00	6.0
SC	20.00	20.00	6.0
ML	30.00	20.00	6.0
CL	100.00	35.00	6.0
OL	50.00	35.00	6.0
MH	30.00	35.00	6.0
CH	100.00	45.00	6.0
OH	100.00	60.00	6.0
PT	100.00	80.00	6.0
P	0.00	0.00	6.0
CM	100.00	35.00	6.0
CM	100.00	35.00	6.0
Rock	0.00	10.00	6.0

7.4 Findings

7.4.1 Ecological Screening Levels

Laboratory analytical results are presented in Appendix 8. Table 12 compares soil analytical results against relevant NEPM ASC (2013) ESL's. Concentrations which exceeded laboratory limit of reporting (LOR) would be in bold, and ESL exceedances are highlighted with a coloured cell. No risk to ecological receptors were identified.

Table 12 Summary of Soil Analytical Results Compared with ESL's for Residential land use.

NEPM Ecological Screening Levels for Soil				BTEX				PAH	TRH			
Bold - Indicates LOR Exceedances X - Indicates Sample has been Excavated				Benzene	Toluene	Ethylbenzene	Xylenes	Benzo(a)pyrene	F1 (C6 - C10)	F2 (>C10 - C16)	F3 (>C16 - C34)	F4 (>C34 - C40)
Colour Shading - Indicates ESL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x												
Sample ID	Sample Date	Soil Texture Class (fine /coarse)	Land Use	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 0.5	LOR 10	LOR 50	LOR 100	LOR 100
BH01 0.2-0.3 X	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH01 0.8-0.9 X	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH01 1.5-1.6 X	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH02 0.2-0.3 X	24/2/21	C	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH02 1.0-1.2 X	24/2/21	C	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH03 0.2-0.3 X	24/2/21	C	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH03 0.8-0.9 X	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH04 0.2-0.3 X	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH04 0.4-0.5	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100
BH05 0.2-0.3 X	24/2/21	F	URBAN	<0.2	<0.5	<0.5	<0.5	<0.5	<10	<50	<100	<100

7.4.2 Ecological Investigation Levels

Laboratory analytical results are presented in Appendix 8. Table 13 compares soil analytical results against relevant EIL's. Concentrations which exceeded laboratory LOR are reported in the table, EIL exceedances are highlighted with a coloured cell.

There was three EIL exceedance for zinc for residential land use in BH01 at 0.8-0.9m bgs, in BH03 at 0.2-0.3mbgs and 0.8-0.9mbgs.

Table 13 Soil Analytical Results Compared Against Ecological Investigation Levels for residential land use

NEPM Ecological Investigation Levels for Soil						Copper (CEC)	Copper (pH)	Nickel	Zinc	Chromium III	Lead	Arsenic	Naphthalene
Bold - Indicates LOR Exceedances X - Indicates Sample Within Inferred Excavation													
Colour Shading - Indicates EIL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x													
Sample ID	Sample Date	EIL Land Use Sensitivity Class	Soil CEC (cmolc/kg)	Soil pH	Soil Texture Class (fine /coarse)	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
BH01 0.2-0.3 X	24/2/21	URBAN	45	6 (3)	F	37	37	122	84	127	8	<5	<1
BH01 0.8-0.9 X	24/2/21	URBAN	45	6 (3)	F	30	30	47	399	63	56	<5	<1
BH01 1.5-1.6 X	24/2/21	URBAN	45	6.6 (1)	F	26	26	97	53	84	7	<5	<1
BH02 0.2-0.3 X	24/2/21	URBAN	10	5.7 (1)	C	6	6	5	45	8	17	<5	<1
BH02 1.0-1.2 X	24/2/21	URBAN	20	6 (3)	C	42	42	138	280	106	29	<5	<1
BH03 0.2-0.3 X	24/2/21	URBAN	10	6 (3)	C	17	17	10	395	12	60	<5	<1
BH03 0.8-0.9 X	24/2/21	URBAN	45	6 (3)	F	40	40	41	461	53	70	<5	<1
BH04 0.2-0.3 X	24/2/21	URBAN	45	7.3 (1)	F	61	61	43	66	38	<5	<5	<1
BH04 0.4-0.5	24/2/21	URBAN	45	7.4 (1)	F	69	69	32	101	28	13	<5	<1
BH05 0.2-0.3 X	24/2/21	URBAN	45	5.6 (1)	F	59	59	29	176	28	20	<5	<1

pH Designation:
(1) Using 0.01M CaCl2 extract. Rayment, G.E. and Lyons, D.J. (2011). "Soil Chemical Methods – Australasia". 495+20 pp. CSIRO Publishing, Melbourne.
(2) pHF (1:5). Adjusted by subtracting 0.75 with +/- 0.25 error to calibrate to the CaCl2 method (per comm. ALS Brisbane Acid Sulphate Soils Laboartory). Methods in accordance with Ahern, C.R., Stone Y., and Blunden B. (1998b). 'Acid Sulfate Soils Assessment Guidelines'. Acid Sulfate Soils Management Advisory Committee, Wollongbar, NSW, Australia.
(3) Classified in accordance with parent material typical soil pH as per the Tasmanian soils database

8 SOIL HUMAN HEALTH DIRECT CONTACT ASSESSMENT

8.1 Guidelines

Guidelines presented are based on potential exposure of human receptors to soil impact which may include:

- Trench workers repairing or building services (typically to 1 m bgs). This classification is not dependent on the land use class.
- Onsite workers which may be exposed to potential shallow soil impact in non-paved areas of the site; and
- Onsite excavation works which may include basement carparks and deep foundations.

8.1.1 Land Use Classification

The NEPM ASC (2013) guidelines have been referenced to ensure that the correct land use and density category has been adopted for the site and the surrounding properties (where applicable). As per NEPM ASC 2013 guidelines, the adopted land use class is dependent on the building density and the opportunity for soil access by site occupants (exposure to potentially impacted soil). Aspects needing to be considered include:

- Whether the site is of sensitive land use such as a childcare centre, preschool, primary school or aged care facility in which case land use Class A is applicable.
- The percentage of paved area to determine direct contact exposure risk and therefore classification as low or high density; and
- Classification based on residential, recreational, or commercial/industrial setting.

8.1.2 Adopted Land Use Classification

The adopted land use class is presented in Table 14. Land use class is based on the opportunity for soil access as per NEPM ASC 2013 guidelines. There is negligible soil access anticipated on the site, and this investigation is to determine potential contamination. For the sake of the report we will investigate future hypothetical site developments and the access to soil excavated from such potential developments, these include future potential site workers, potential construction workers, and potential trenchworks on site.

Table 14 Summary of Land Use Setting and Density for Determining Exposure Risk

Soil Bores	Construction Phase	Location	Land Use	Pathway	Land Use Class
All soil	During	Site	Construction worker and trench workers	ALL	D and trench worker specific
		Offsite	Neighbouring residence	ALL	A
	Post	Site	Future trench workers	ALL	D and trench worker specific
			Residence	ALL	A
		Offsite	Neighbouring residence	ALL	A

DC – Dermal Contact - Trench Worker Guidelines (CRC CARE 2013); DI – Dust Inhalation - HIL Guidelines (NEPM ASC 2013); SI – Soil Ingestion - HIL Guidelines (NEPM ASC 2013) or ALL – All of above

8.1.3 Health Investigation & Screening Levels

The main exposure pathways and methods for assessing heath risk from contaminated soils are presented in Table 15.

Table 15 Summary of Exposure Pathways and Preliminary (Tier 1) Methods for Assessing Human Exposure Risk

Exposure Scenario	Contaminant Type	Tier 1 Assessment Method	Reference
Vapour Inhalation – Indoor (PVI)	Petroleum Hydrocarbons	HSL's (addressed in PVI sections)	NEPM ASC (2013)
Vapour Inhalation – Trench (PVI)			CRC CARE (Friebel & Nadebaum, 2011)
Dermal Contact		HSL's	
Dust Inhalation	Metals PAH's	Health Investigation Levels (HIL's)	NEPM ASC (2013)
Soil Ingestion			

PVI – Petroleum Vapour Intrusion

8.2 Findings

8.2.1 Dermal Contact - Petroleum Hydrocarbons

Laboratory analytical results are presented in Appendix 8. Table 16 presents soil hydrocarbon analytical results compared against CRC CARE (Friebel & Nadebaum, 2011) HSL guidelines for assessing dermal contact risk. Concentrations which exceeded laboratory LOR would be marked in bold, HSL exceedances would be highlighted with a coloured cell indicating the highest HSL land used class which is exceeded.

There were no hydrocarbon guideline exceedances for dermal contact. No dermal contact risk has been identified.

Table 16 Soil Analytical Results Compared Against CRC CARE (Friebel & Nadebaum, 2011) Guidelines for Dermal Contact

CRC CARE Health Screening Level Dermal Contact Hazard from Soil Hydrocarbons'		EP080: BTEXN					EP080/071: TRH			
		Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction
Units		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0.2	0.5	0.5	0.5	1	10	50	100	100
HSL A Low Density Residential		100	14000	4500	12000	1400	4400	3300	4500	6300
HSL C Recreational		120	18000	5300	15000	1900	5100	3800	5300	7400
HSL D Commercial/Industrial		430	99000	27000	81000	11000	26000	20000	27000	38000
Intrusive Maintenance Worker		1100	120000	85000	130000	29000	82000	62000	85000	120000
Date	Sample									
24/02/2021	BH01 0.2-0.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH01 0.8-0.9 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH01 1.5-1.6 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH02 0.2-0.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH02 1.0-1.2 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH03 0.2-0.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH03 0.8-0.9 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH04 0.2-0.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH04 0.4-0.5	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100
24/02/2021	BH05 0.2-0.3 X	<0.2	<0.5	<0.5	<0.5	<1	<10	<50	<100	<100

8.2.2 Dust Inhalation & Soil Ingestion

Laboratory analytical results are presented in Appendix 8. Soil analytical results are compared against combined dust inhalation and soil ingestion risk is assessed through the application of NEPM ASC (2013) Health Investigation Levels (HILs) for exposure to soil contaminants are presented in Table 17.

Concentrations which exceeded laboratory LOR would be highlight in bold (except for the metals), and HIL exceedances would be highlighted with a coloured cell indicating the highest HIL land used class which is exceeded.

There were no guideline exceedance for dust inhalation and soil ingestion at commercial/industrial land use, and no dust inhalation and soil ingestion risks identified.

Table 17 Soil Analytical Results Compared Against NEPM ASC (2013) Health Investigation Levels Guidelines

Bold - Indicates LOR Exceedance in Non Metalic Compounds		EA002 : pH (Soils)	EA055: Moisture Content	EG005T: Total Metals by ICP-AES														EG035T: Total Recoverable Mercury by FIMS	EP075(SIM)B: Polynuclear Aromatic Hydrocarbons																			
NEPM Health Investigation Levels (HIL's) **Dust Inhalation and Soil Ingestion Assessment** X - Indicates Sample Within Proposed Excavation Zone		pH Value	Moisture Content	Arsenic	Barium	Beryllium	Boron	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Mercury	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	PAHs	Benzo(a)pyrene TEQ (WHO)
Units		pH Unit	%	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		0.1	1	5	10	1	50	1	2	2	5	5	5	2	5	5	5	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
HIL A Low Density Residential	☑ HIL A			100		60	4500	20		100	6000	300	3800	400	200		7400	40																	300	3
HIL C Recreational	☑ HIL C			300		90	20000	90		300	17000	600	19000	1200	700		30000	80																	300	3
HIL D Commerial/Industrial	☑ HIL D			3000		500	300000	900		4000	240000	1500	60000	6000	10000		400000	730																	4000	40
Sample date:	Sample ID																																		
24/02/2021	BH01 0.2-0.3 X		----	22	<5	180	<1	<50	<1	127	30	37	8	583	122	<5	92	84	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/02/2021	BH01 0.8-0.9 X		----	17.8	<5	280	<1	<50	2	63	35	30	56	538	47	<5	55	399	0.3	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/02/2021	BH01 1.5-1.6 X		6.6	25.5	<5	280	<1	<50	<1	84	68	26	7	1330	97	<5	70	53	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/02/2021	BH02 0.2-0.3 X		5.7	5.3	<5	60	<1	<50	<1	8	6	6	17	201	5	<5	21	45	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/02/2021	BH02 1.0-1.2 X		----	14.9	<5	120	<1	<50	2	106	38	42	29	672	138	<5	83	280	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/02/2021	BH03 0.2-0.3 X		----	6.4	<5	60	<1	<50	2	12	8	17	60	211	10	<5	24	395	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/02/2021	BH03 0.8-0.9 X		----	11.7	<5	170	<1	<50	2	53	26	40	70	562	41	<5	61	461	0.2	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/02/2021	BH04 0.2-0.3 X		7.3	19.3	<5	170	<1	<50	<1	38	28	61	<5	537	43	<5	104	66	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/02/2021	BH04 0.4-0.5		7.4	18.6	<5	170	<1	<50	<1	28	36	69	13	500	32	<5	135	101	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5
24/02/2021	BH05 0.2-0.3 X		5.6	15.7	<5	150	<1	<50	<1	28	29	59	20	550	29	<5	131	176	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5

9 INDOOR INHABITANT PVI ASSESSMENT – HSL's

This PVI assessment has been conducted in accordance with relevant CRC CARE Technical Documentation and NEPM ASC 2013 guidelines presented in references section of this report. The HSL assessment approach is generally the first (Tier 1) investigation phase adopted for assessing PVI risk at petroleum hydrocarbon (PHC) impacted sites. HSL guidelines have been applied for samples collected from the site to account for risks that may be associated with volatile hydrocarbon vapour intrusion into confined spaces where there may be an inhalation risk through longer term exposure. This does not constitute a full vapour risk assessment but provides additional information from which to further quantify any risk.

A detailed investigation (Tier 2 to 3) is recommended over an HSL assessment where an acute risk has been identified at the site (CRC CARE 2013) because of:

- Migrating product on surface soils beneath buildings;
- Strong PHC odours;
- Flammable risk in confined spaces; and/or
- Health complaints from occupants.

Based on the site visits, none of the above conditions have been identified at the site. If the outcome of this Tier 1 assessment reveals HSL exceedances for hydrocarbon vapour intrusion, a more detailed (Tier 2) assessment will be required to further evaluate the human health risk.

PVI risk is initially interpreted through the development of HSL threshold limits from the following classifications:

- The geology and or hydrogeology of the investigation point; and
- Land use sensitivity:

The resulting HSL threshold limits are compared with laboratory analytical results.

9.1 Selected Media for Assessing PVI Risk

Table 18 presents a summary of the preferred HSL approach to assessing PVI risk. In this case, all soil investigated was within the excavation zone and within the water table.

Table 18 Preferred Methods for Determining Site PVI Risk

Media Analysed	Method	Limitations	Order of Preference
Soil Gas	Concentrations of a soil gas through a soil vapor probe	This approach provides the most reliable data in interpreting PVI risk, although direct modelling should be applied if concentrations exceed HSL threshold limits.	Primary
Groundwater	Concentrations of PHC in groundwater through deployment of monitoring wells	More robust and reliable that soil in determining onsite and in particular, offsite risks. Determining PVI risk based on groundwater is inherently conservative when interpreting vapour risk to account for not readily discernible preferential pathways. Reference may be drawn to alternative assessment approaches: 1) Application of site-specific conditions to the CRC CARE model for assessing PVI risk 2) Soil gas interpretation for areas where a PVI risk is identified from groundwater analysis.	Secondary
Soil	Concentrations of PHC in soil	Concentrations in soil may be subject variability due to soil moisture, organic content and oxygen ingress all which create significant bias in threshold values. Reliance is place on utilizing groundwater analysis over soil. Soil results provide localised information.	Tertiary

9.2 Land Use Class

For surrounding properties, the potential PVI risk is characterized through application of CRC CARE HSL's for each individual property based on their existing land use (NEPM ASC 2013; Friebel & Nadebaum 2010). The CRC CARE guidelines have been referenced to ensure that the correct land use and density category has been adopted for surrounding land use to ensure health risks are consistent with the HSL models. Aspects considered include the:

- Sensitivity of the existing or potential land use;
- Percentage of paved area for defining potential vapour migration risk;
- Type of basement garage which may influence the confinement of PHC vapors;
- Presence of a slab or cavity for discerning vapour intrusion risk.

If hydrocarbon impacted soil is discerned at the site, consideration is given to downgradient receptors. Where applicable, land use class therefore considers:

- Downgradient receptors where onsite HSL exceedances have been identified in soil; and
- Variations in land use for different parts of the proposed development.

The following land use classes are applied:

- *HSL A for Low Density Residential*

9.3 Soil Assessment

Laboratory analytical results are presented in Appendix 8. Table 19 presents the results against a potential indoor vapour risk. Concentrations which exceeded laboratory LOR would be highlighted in bold. HSL exceedances would be highlighted with a coloured cell.

There was no indoor vapour risk identified.

Table 19 Soil Analytical Results Compared Against HSL D for Indoor Vapour Risk

Soil Hydrocarbon HSL's for Assessing Indoor Vapour Intrusion (NEPM 2013) **Soil Sample Analysis**					EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances					Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	F1	F2
Colour Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, *** 20-50 x, **** >50 x											
Sample ID	Sample Date	Depth Class	Grain Class	HSL	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
					LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 1	LOR 10	LOR 50
BH01 0.2-0.3	24/02/2021	>SLAB/CUT RL	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 0.8-0.9	24/02/2021	>SLAB/CUT RL	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 1.5-1.6	24/02/2021	>SLAB/CUT RL	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 0.2-0.3	24/02/2021	>SLAB/CUT RL	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 1.0-1.2	24/02/2021	>SLAB/CUT RL	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 0.2-0.3	24/02/2021	>SLAB/CUT RL	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 0.8-0.9	24/02/2021	>SLAB/CUT RL	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 0.2-0.3	24/02/2021	0 - 1	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 0.4-0.5	24/02/2021	0 - 1	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 0.2-0.3	24/02/2021	0 - 1	CLAY	A	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

10 TRENCH WORKER PVI ASSESSMENT – HSL's

10.1 Classification

The following Health Screening Assessment is based on hydrocarbon vapour intrusion risk to subsurface excavation workers within excavations. This is assessed through analysis of vapours from soil and soil vapours. Land use classes are not applicable when assessing vapour intrusion into trenches.

Soil and soil vapour HSL's for assessing hydrocarbon risk to maintenance workers are based on CRC CARE Technical Report 10 guidelines (Friebel & Nadebaum 2011) and the following variables:

- Dominant grain size class of material at the soil sample depth or based on the dominant grain class of the backfill material based on US Agriculture Soil Classification System (SCS) and partitioning into either sand, silt or clay; and
- Classifying soil according to depth ranges: 0 to 2 m; 2 to 4 m; 4 to 8 m; and greater than 8 m;

10.2 Findings

Laboratory analytical results are presented in Appendix 8. Summary of Soil Analytical Results Compared against HSL's for Assessing PVI Risk to Trench Workers are presented in Table 20. Concentrations that exceeded laboratory LOR would be marked in bold, and if there were any HSL exceedances they would be highlighted with a coloured cell. There were no exceedances of the CRC CARE HSL guidelines for Assessing PVI Risk to Trench Workers and no risk identified.

Table 20 Summary of Soil Analytical Results Compared against HSL's for Assessing PVI Risk to Trench Workers

CRC CARE Health Screening Level Assessment for PHC Inhalation Risk To Trench Workers From Soil Sample Analysis				EP080: BTEXN					EP080/071: TRH	
Bold - Indicates LOR Exceedances										
Dark Grey Shading - Indicates HSL Exceedances: >1 x, * 2-5 x, ** 5-20 x, * 20-50 x, **** >50 x**				Benzene	Toluene	Ethylbenzene	Total Xylenes	Naphthalene	C6 - C10 Fraction	>C10 - C16 Fraction
Sample ID	Sample Date	Depth Class	Grain Class	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
				LOR 0.2	LOR 0.5	LOR 0.5	LOR 0.5	LOR 1	LOR 10	LOR 50
BH01 0.2-0.3	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 0.8-0.9	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH01 1.5-1.6	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 0.2-0.3	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH02 1.0-1.2	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 0.2-0.3	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH03 0.8-0.9	24/02/2021	4 to 8m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 0.2-0.3	24/02/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH04 0.4-0.5	24/02/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50
BH05 0.2-0.3	24/02/2021	0 to 2m	CLAY	<0.2	<0.5	<0.5	<0.5	<1	<10	<50

11 SOIL DISPOSAL ASSESSSMENT

11.1 Guidelines

Soil which is excavated from the site for landfill disposal is to be assessed against the Environmental Protection Authority Tasmania's Information Bulletin 105 (*IB105*) for Classification and Management of Contaminated Soil for Disposal. The EPA Tasmania uses four categories to classify contaminated soil as per Table 21:

- (Level 1) Fill Material
- (Level 2) Low Level Contaminated Soil
- (Level 3) Contaminated Soil and
- (Level 4) Contaminated Soil for Remediation

Fixed numerical values are presented for soil concentrations and leachable fraction concentrations.

Table 21 Summary of IB105 Classification Guidelines

	Classification (with reference to Table 2)	Controlled Waste[1]	Comments
Fill Material[2] (Level 1)	Soil that exhibits levels of contaminants below the limits defined under *Fill Material* in Table 2.	Unlikely	Soil classified as *Fill Material* can still be a 'pollutant' under the *Environmental Management and Pollution Control Act 1994* and needs to be responsibly managed.
Low Level Contaminated Soil (Level 2)	Soil that exhibits levels of contaminants above the limits defined under *Fill Material* but below the limits defined under *Low Level Contaminated Soil* in Table 2.	Likely	Where leachable concentrations have not been prescribed, maximum total concentrations will be used to classify the soil.
Contaminated Soil (Level 3)	Soil that exhibits levels of contaminants above the limits defined under *Low Level Contaminated Soil* but below the limits defined under *Contaminated Soil* in Table 2.	Yes	Where leachable concentrations have not been prescribed, maximum total concentrations will be used to classify the soil.
Contaminated Soil for Remediation (Level 4)	Soil that exhibits levels of contaminants above the limits defined under *Contaminated Soil* in Table 2 (regardless of the maximum total concentrations) is generally ***not*** considered acceptable for off-site disposal without prior treatment.	Yes	Soil that contains contaminants that do not have criteria for leachable concentrations (*e.g.* petroleum hydrocarbons), and the levels of contaminants exceed the maximum total concentrations listed in *Contaminated Soil*, are generally classified as *Contaminated Soil for Remediation*.

[1] Controlled Waste is defined in the *Environmental Management and Pollution Control Act 1994*.
[2] Criteria for *Fill Material* are the limits set by the Director for the purposes of R.9(2)(a)(ii) in the *Regulations*.

11.2 Findings

The soil samples have been compared against IB105 guidelines for potential future soil disposal, see Table 22. The following conclusions can be made:

- A total of 2 of the 10 samples tested returned classification of Level 1 Material.
- A total of 8 of the 10 samples tested returned classification of Level 2 Material (Low Level Contaminated Soil) due to elevated levels of heavy metals including chromium, manganese, nickel and zinc.

Table 22 Soil Analytical Results Compared Against IB105 Investigation Limits for soil Disposal

Information Bulletin 105 **Classification and Management of Contaminated Soil For Disposal**		Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Copper	Cobalt	Lead	Manganese	Mercury	Nickel	Selenium	Zinc	Benzo(a)pyrene	C6 - C9 Fraction	C10 - C36 Fraction (sum)	Sum of polycyclic aromatic hydrocarbons	Benzene	Toluene	Ethylbenzene	Total Xylenes
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		5	10	1	1	2	5	2	5	5	0.1	2	5	5	0.5	10	50	0.5	0.2	0.5	0.5	0.5
Investigation Level Selected																						
IB105 Level 1		<20	<300	<2	<3	<50	<100	<100	<300	<500	<1	<60	<10	<200	<0.08	<65	<1000	<20	<1	<1	<3	<14
IB105 Level 2		20	300	2	3	50	100	100	300	500	1	60	10	200	0.08	65	1000	20	1	1	3	14
IB105 Level 3		200	3000	40	40	500	2000	200	1200	5000	30	600	50	14000	2	650	5000	40	5	100	100	180
IB105 Level 4		750	30000	400	400	5000	7500	1000	3000	25000	110	3000	200	50000	20	1000	10000	200	50	1000	1080	1800
24/02/2021	BH01 0.2-0.3 X	<5	180	<1	<1	127	37	30	8	583	<0.1	122	<5	84	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH01 0.8-0.9 X	<5	280	<1	2	63	30	35	56	538	0.3	47	<5	399	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH01 1.5-1.6 X	<5	280	<1	<1	84	26	68	7	1330	<0.1	97	<5	53	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH02 0.2-0.3 X	<5	60	<1	<1	8	6	6	17	201	<0.1	5	<5	45	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH02 1.0-1.2 X	<5	120	<1	2	106	42	38	29	672	<0.1	138	<5	280	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH03 0.2-0.3 X	<5	60	<1	2	12	17	8	60	211	<0.1	10	<5	395	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH03 0.8-0.9 X	<5	170	<1	2	53	40	26	70	562	0.2	41	<5	461	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH04 0.2-0.3 X	<5	170	<1	<1	38	61	28	<5	537	<0.1	43	<5	66	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH04 0.4-0.5 X	<5	170	<1	<1	28	69	36	13	500	<0.1	32	<5	101	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5
24/02/2021	BH05 0.2-0.3 X	<5	150	<1	<1	28	59	29	20	550	<0.1	29	<5	176	<0.5	<10	<50	<0.5	<0.2	<0.5	<0.5	<0.5

12 CONCEPTUAL SITE MODEL

Figure 9 illustrates potential risks that may be associated with potential site contamination. Potential pathways have been identified and where possible ruled out in the Conceptual Site Model.

12.1 Potential Contaminants

The potential contaminants include; Total Petroleum/Recoverable Hydrocarbons (TPH/TRH), Mono Aromatic hydrocarbons: Benzene, Toluene, Ethylbenzene, Xylene, Naphthalene (BTEXN), Polynuclear Aromatic Hydrocarbons (PAHs), a suite of 15 Heavy Metals and Asbestos.

12.2 Potential Sources of Contamination

The site is vacant land adjacent to residential properties. The site was formally the shoreline of Prince of Wales Bay which has been infilled overtime. The most recently added fill is likely to have been derived from Goodwood Road and Howard Road upgrade. The following contaminating activities on neighbouring properties may have impacted the site:

- Surface contamination from the proximity to Goodwood Road.
- Underground fuel storage tanks at Elwick Racecourse & Derwent Barracks
- Dust fall out from zinc works operation at NyrStar, 1.5km south east of the site.

12.3 Potential Human Receptors

The potential human receptors considered during this investigation are the construction workers (commercial land users / trench worker specific) during the site redevelopment, future trench and maintenance workers plus current and future neighbouring residence and recreational users of Goodwood Park plus future residences on the site.

12.4 Potential Ecological Receptors

The closest ecological receptor is the River Derwent at Prince of Wales Bay, approximately 0.25 km east of the site.

12.5 Identified Receptors and Known Contamination

12.5.1 Identified Human Receptors

No NEPM ASC (2013) human Health Investigation Limits or CRC CARE (2011) Health Screening Levels were found to be exceeded, hence no human health risks have been identified.

12.5.2 Identified Ecological Receptors

The River Derwent has been identified as an ecological receptor as there were the following exceedances:

- There were a total of three (3) EIL exceedance for zinc for residential land use in material at BH01 and BH03 locations.

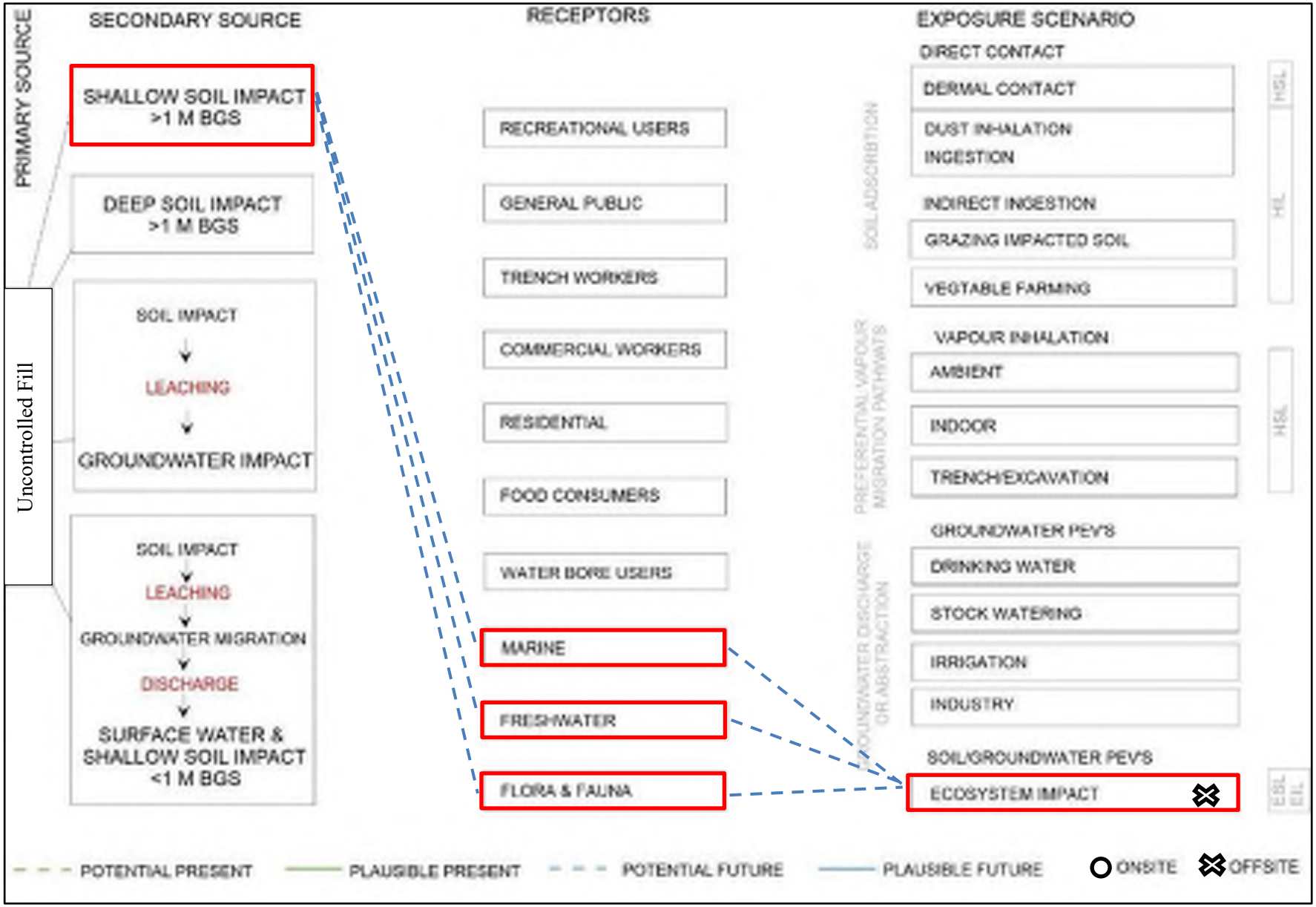

Figure 9 Conceptual Site Mode

13 CONCLUSIONS & RECOMMENDIATIONS

13.1 Desktop Assessment

The following information was gathered during the desktop investigation:

- The site is zoned *Utility* but is proposed to be rezoned as *General Residential* under the *Glenorchy City Councils Interim Planning Scheme of 2015.*
- The geology of the site is man-made sediments of sand and clays derived from most like basalt and dolerite weathered soils from the Goodwood Road upgrade.
- An EPA Tasmanian search confirmed that historical underground petroleum storage system (UPSS) was present at both Elwick Racecourse & Derwent Barracks. The current investigation confirmed no soil hydrocarbon impact was detected.
- The EPA also confirmed that there was an active UPSS at Linen Services Tasmania at 34-36 Negara Crescent, Goodwood in 2011. GES have been ruled out as the property as potentially impacting the site as it is 250m down gradient from the site.
- WorkSafe Tasmania (WST) confirmed that the following records management system held no information for the site: the EPA's Environmentally Relevant Land Use Register (ERLUR) and the WST Dangerous Substances database.
- Historical aerial photograph review revealed that the site was sandy mudflats almost beach like in appearance in 1957, since then the area has been slowly infilled. It has never house potentially contaminating activities except for the acquisition of uncontrolled fill over time.
- Groundwater is inferred to be converging on the site and then the water migrates east towards Prince of Wales Bay, where it enters the bay 250m from the site; the bay is part of the River Derwent.
- There is the potential for Acid Sulfate Soils (ASS) to be present at the site due to the proximity to the waters of the River Derwent, however for the following reasons ASS is ruled out; 1) field pH was above 5; 2) there was no evidence of water logging or associated odour and 3) there was no blue gley staining of material.
- Potentially contaminating activities in the vicinity of the site include uncontrolled fill, fallout from operating highway, former underground fuel storage and proximity to the zinc works.
- Contaminants Of Potential Concern (COPC) include the following: TPH/TRH; Mono Aromatic hydrocarbons: (BTEXN); PAH; and heavy metals and / or Asbestos.

13.2 Soil Assessment

From the soil assessment, it is concluded that:

- No asbestos fibres or sheeting were identified in the fill on site and therefore the presence of asbestos has been ruled out.
- No visual evidence of water logging or aromatic evidence of a reduced oxygen environment which may have indicated the presence of Acid Sulfate Soils or detection from the field pH testing as pH values ranged 5.6 to 7.4. Therefore, the presence of ASS has been ruled out.
- Human Health: There were no human health guideline exceedances for dermal contact or for dust inhalation and soil ingestion. There were no indoor vapour risks or trench worker vapour risks identified. Therefore, no risk to human receptors from potential soil contamination have been identified.
- Environment: The River Derwent has been identified as an ecological receptor. There were three EIL exceedance for zinc in material at BH01 and BH03 soil bore locations.

- Excavated Soil Management: In terms of *IB105*; 8 of the 10 primary soil samples, are considered Level 2 Material (Low Level Contaminated Soil) due to elevated levels of chromium, manganese, nickel, and zinc.

13.3 Conclusions

13.3.1 Human Health

There were no exceedances to human health guidelines. Based on the current assessment no risk to human receptors from potential soil contamination have been identified.

13.3.2 Environmental Protection Measures

There were ecological exceedances identified at the site and every effort possible should be made to minimise sediment runoff from the site into the River Derwent. GES recommends the following protection measures:

- A Soil and Water Management Plan (SWMP) should be written and implemented prior to any earthworks being undertaken on the site.
- All contractors working on site should be made aware of this plan.

13.3.3 Soil Disposal Recommendations

GES recommends the following:

- In terms of soil disposal, the soil in the areas tested on site is classified as Level 2 Material. Any excavated material for offsite must be managed in accordance with the EPA Tasmanians *IB105* and the controlled waste transport regulations.

13.3.4 Statement of Suitability

Based on the current results of the Environmental Site Assessment, providing the recommended protection measures are put in place then any planned excavation works associated with the site redevelopment will not adversely impact on human health or the environment. No further remediation and/or protection measures are required.

Yours faithfully,

Sarah Joyce BSc (Hons)

Senior Environmental Scientist

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LIMITATIONS STATEMENT

This *Environmental Site Assessment* Report has been prepared in accordance with the scope of services between Geo-Environmental Solutions Pty. Ltd. (GES) and by the Department of Communities Tasmania ('the Client'). To the best of GES's knowledge, the information presented herein represents the Client's requirements at the time of printing of the Report. However, the passage of time, manifestation of latent conditions or impacts of future events may result in findings differing from that described in this Report. In preparing this Report, GES has relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations referenced herein. Except as otherwise stated in this Report, GES has not verified the accuracy or completeness of such data, surveys, analyses, designs, plans and other information.

The scope of this study does not allow for the review of every possible soil and groundwater contaminant over the whole area of the site. Samples collected from the investigation area are assumed to be representative of the areas from where they were collected and indicative of the contamination status of the site at that point in time. The conclusions described within this report are based on these samples, the results of their analysis and an assessment of their contamination status.

This report does not purport to provide legal advice. Readers of the report should engage professional legal practitioners for this purpose as required.

No responsibility is accepted for use of any part of this report in any other context or for any other purpose by third party.

Appendix 1 GES Staff

Geo-Environmental Solutions (GES) is a specialist geotechnical and environmental consultancy providing advice on all aspects of soils, geology, hydrology, and soil and groundwater contamination across a diverse range of industries.

Geo Environmental Solutions Pty Ltd:

- ACN – 115 004 834
- ABN – 24 115 004 834

GES STAFF - ENGAGED IN SITE INVESTIGATION WORKS

Dr John Paul Cumming B.Agr.Sc (Hons) Phd CPSS GAICD

- Principle Author and Principle Environmental Consultant
- PhD in Environmental Soil Chemistry from the University of Tasmania in 2007
- 18 years' experience in environmental contamination assessment and site remediation.

Ms Sarah Joyce BSc (Hons)

- Senior Environmental Scientist
- Honours in Geography and Environmental Science at the University of Tasmania in 2003;
- Undergraduate Degree Double Major in Geology and Geography & Environmental Science
- 15 years professional work experience and 8 years contaminated site assessment
- Attendance to recent relevant workshops by ALGA – Risk Assessment 101 (May 2018); Vapour Intrusion Workshop (Part A) – Petroleum Hydrocarbons (July 2017)

Mr Mark Downie B.Agr.Sc

- Soil Scientist with 15 years professional experience
- 8 Year experience in contamination assessment and reporting of soils and groundwater.

GES STAFF – CONTAMINATED SITES EXPERIENCE

Dr Sam Rees B.Agr.Sc (Phd)

- Soil & Environmental Scientist
- 6 years' experience in hydrocarbon and heavy metal contamination assessment and reporting of soils and groundwater.

Mr Aaron Plummer (Cert. IV)

- Soil Technician
- 6 years' experience in hydrocarbon and heavy metal contamination sampling of soils and groundwater.

Mr Grant McDonald (Adv. cert. hort.)

- Soil Technician
- 10 years' experience in hydrocarbon and heavy metal contamination sampling of soils and groundwater.

Appendix 2 Site Photographs

View of the site south east towards junction of Howard Road and Barron Avenue

BH01 Location

View east towards Goodwood Park from BH01

View southwest towards 154 Howard road from BH01

View west to the cul-de-sac area of Howard Road

View east along the footpath of Goodwood Road

View across the site to the northwest to BH01

Soil sample BH01 – 1.5-1.6

BH01 Sample location

Sample location of BH02

Sample location of BH02

Sample BH02-0.2-0.3

Sample BH02-1.0-1.2

BH02 sample location along Howard Road to the intersection on Goodwood Road

Sample location of BH03, corner of Howard Road and Barron Avenue

Sample BH03-0.2-0.3

Sample BH03-0.8-0.9

Sample location of BH04, view to the northwest

Sample location of BH04, view to the southwest & 152 Howard Road

Sample BH04-0.2-0.3

Sample BH04-0.4-0.5

Sample BH05-0.2-0.3

Sample location of BH05, view to the southeast

Sample location of BH05, view to the southwest & 154 Howard Road

Appendix 3 EPA PIR Search Results

Environment Protection Authority

GPO Box 1550 HOBART TAS 7001 Australia

Enquiries: Contaminated Sites Unit
Phone: +61 3 6165 4599
Email: contaminatedsites@epa.tas.gov.au
Web: www.epa.tas.gov.au
Our Ref: (21/404: D21-27019)

22 March 2021

Ms Sarah Joyce
Geo Environmental Solutions
29 Kirksway Place
BATTERY POINT TAS 7004

Email: sjoyce@geosolutions.net.au

Dear Ms Joyce

PROPERTY INFORMATION REQUEST
Crown land at Cnr Howard and Goodwood Road, Goodwood

On 16 February 2021, the Contaminated Sites Unit received your Property Information Request relating to the land referred to above ('the Site'). A search of relevant databases and records has been undertaken.

No records relating to contamination or potentially contaminating activities on the Site were found, however records relating to properties within 250m of the site were found.

from LIST Map

2B Goodwood Road, Dowsing Point

- May 2000, EPA received notification of a diesel spill at the Site; the source was identified as a leaking fuel line from an above ground storage tank. A report *Derwent Barracks- Diesel Spill - Report on Site investigations and Remediation*, dated June 2000 and prepared by GHD, summarised the work undertaken to delineate the extent of the contamination and remediate the Site. Proposed works

included the removal of the leaking bowser and the transport of 580 tonnes of contaminated soil to the Port Latta Landfill.

- In June 2001 EPA were advised that further contamination was identified when a petrol underground petroleum storage system (UPSS) was removed.
- In June 2007, EPA approved the disposal of 5m³ of low-level contaminated soil (Cr and Ni) to the Copping Waste Depot. The waste was generated when groundwater wells were installed.
- In March 2014, EPA received documents regarding the removal and decommissioning of an abandoned UPSS at the Site. The letter from EPA dated 10 April 2014 to the landowner states:

  "The submission of the form fulfils the requirements of regulation 31(3) of the Environmental Management and Pollution Control (Underground Petroleum Storage Systems) Regulations 2010 (UPSS Regulations).

  Please note that:

  - the decommissioning form and report must be kept by the landowner for a period of 10 years and if the site is sold, they must be delivered to the new landowner; and
  - the Decommissioning Assessment Report does not necessarily represent an environmental site assessment for the whole parcel of land, as it is only required to address the area in the immediate vicinity of the UPSS. If redevelopment or a change of use of the site is proposed, the Council may require an environmental site assessment of the whole site to be undertaken."

The Department of Defence and/or The Australian Government Department of Environment and Energy may hold additional records of potentially contaminating activities and/or known contamination issues that may be relevant to the Derwent Barracks.

34-36 Negara Crescent - an underground petroleum storage system (UPSS) total capacity of 5000L was registered as Active in January 2011.

2-6 Goodwood Road - EPA received advice in October 2011 that an abandoned UPSS was present at the Elwick Racecourse; no records relating to decommissioning have been received.

Whilst no record of contamination at either site was found during the search, the storage of fuel is considered a potentially contaminating activity.

Historical WorkSafe Tasmania File 0760 (1956-1990) refers to the storage of dangerous goods in underground storage tanks (UST) at the former Department of Transport & Construction, Dowsings Point Works Depot; however, the street address is incomplete.

Historical WorkSafe EPA records indicate that a smallgoods facility at **40-42 Negara Crescent** was the subject of a Notice of Registration circa 1991. Under *Environmental Management and Pollution Control Act 1994* (EMPCA) the premise was determined to be level 1, therefore regulation by EPA would have ceased. WST may have records regarding the storage of dangerous goods at this premise.

No other records relating to contamination or potentially contaminating activities at the adjacent properties were found.

The search of records is restricted to those held by EPA and includes records relating to: The *Environmental Management and Pollution Control (Underground Petroleum Storage Systems) Regulations 2020;* Industrial Sites (which are or have been regulated by EPA); historical landfills; and contamination issues reported to the Contaminated Sites Unit. In addition, the Incidents and Complaints database and records relating to the historical storage of dangerous goods (as detailed below) are searched.
Please note that the dangerous goods licensing records referred to by EPA are for sites with underground storage tanks that ceased holding Dangerous Goods Licences prior to 1993. WorkSafe Tasmania hold the records for these Licences after 1993.

The following additional sources of contaminated sites information may also be helpful to you

- The **LIST Map** layers available. https://epa.tas.gov.au/regulation/site-information

- '***EPA Regulated Premises***' identifies the location of Level 2 regulated premises as well as contaminated sites which are currently regulated. Regulatory documents related to each premises are available from this layer
- '***EPA Underground Petroleum Storage Systems***' shows sites where EPA has received notification of the registration, temporary decommissioning or permanent decommissioning of underground petroleum storage systems (UPSS) under the *Environmental Management and Pollution Control (Underground Petroleum Storage Systems) Regulations 2020* (UPSS Regulations).

- Local councils issue Development Approvals under the *Land Use Planning and Approvals Act 1993*, Environment Protection Notices and Environmental Infringement Notices, and record complaints. They may hold additional information that may be relevant to a potentially contaminated site.
- WorkSafe Tasmania (1300 366 322 or wstinfo@justice.tas.gov.au) may have issued dangerous goods licences and/or may hold relevant records for the Site and adjoining properties. As the storage of dangerous goods/fuels is an environmentally relevant activity, you may wish to contact them for further information.

EPA does not hold records on all sites that are or may be contaminated. You should consider obtaining a site history to determine the likelihood of contamination. If contamination on the Site or an adjacent property is considered likely, further assessment by a competent environmental assessment practitioner is recommended. Site assessments should be conducted in accordance with the *National Environment Protection (Assessment of Site Contamination) Measure 1999*, National Environment Protection Council (or as varied).
https://epa.tas.gov.au/regulation/contaminated-sites/identification-and-assessment-of-contaminated-land/contaminated-site-assessment

Please note since 1 July 2015, the Director requires all environmental site assessments and reports, submitted to the Contaminated Sites Unit for consideration, to be prepared by a person certified as a specialist contaminated sites consultant under a scheme approved by the Director.
Effective 30 June 2018, the endorsed scheme is operated by Certified Environmental Practitioners (CEnvP). Consultants certified under this scheme are approved to use the seal **CEnvP Site Contamination**.
https://www.cenvp.org.
Further details are available at: https://epa.tas.gov.au/regulation/contaminated-sites/identification-and-assessment-of-contaminated-land/engaging-a-contaminated-site-assessment-consultant

The *Environmental Management and Pollution Control (Underground Petroleum Storage Systems) Regulations 2020* contain requirements relating to the registration, operation and decommissioning of underground fuel tanks. Information is available at: https://epa.tas.gov.au/regulation/underground-fuel-tanks All underground petroleum storage systems in use after 30 March 2010 are required to be registered

Under the *Right to Information Act 2009* (RTI Act), you are entitled to apply for any records mentioned within this letter such as reports, letters, or other relevant documents. For further information on how the RTI process works and how to request information under the RTI Act please visit the Department of Primary Industries, Parks, Water and Environment website or https://dpipwe.tas.gov.au/about-the-department/governance-policies-and-legislation/right-to-information

If you are purchasing a property, you should consider Part 5A of the *Environmental Management and Pollution Control Act 1994* (EMPCA) which defines and specifies requirements for managing contaminated sites. If there is reason to believe the site is, or is likely to be, contaminated there are certain requirements that you must meet (e.g. notification of a likely contaminated site to the Director, EPA as outlined in section 74B of the EMPCA).

Although all due care has been taken in the preparation of this letter, the Crown gives no warranty, express or implied, as to the accuracy or completeness of the information provided. The Crown and its servants or agents accept no responsibility for any loss or damage arising from reliance upon this letter, and any person relying on the letter does so at their own risk absolutely.

If you have any queries in relation to the matters above, please contact the Contaminated Sites Unit using the details at the head of this correspondence or refer to the EPA website at www.epa.tas.gov.au and click on 'Regulation to locate information on Underground Fuel Tanks and Contaminated Sites.

As you are aware, property searches incur a charge of $364.50. An invoice will be emailed as instructed. If you require this letter and invoice posted, please advise the Contaminated Sites Unit.

Yours sincerely

Liz Canning
SENIOR ENVIRONMENTAL OFFICER - CONTAMINATED SITES

Email: Miran@geosolutions.net.au

Attachment: Invoice

4

Appendix 4 Historical Photographs

Plate 1 Historical Aerial Photograph, 12 April 2019 (C/O Google Earth)

Plate 2 Historical Aerial Photograph, 12 June 2015 (C/O Google Earth)

Plate 3 Historical Aerial Photograph, 14 October 2003, (C/O Google Earth)

Plate 4 Historical Aerial Photograph, 1992 The Site and surrounding land (c/o DPIPWE)

Plate 5 Historical Aerial Photograph, 1973 The Site and surrounding suburbs (c/o DPIPWE)

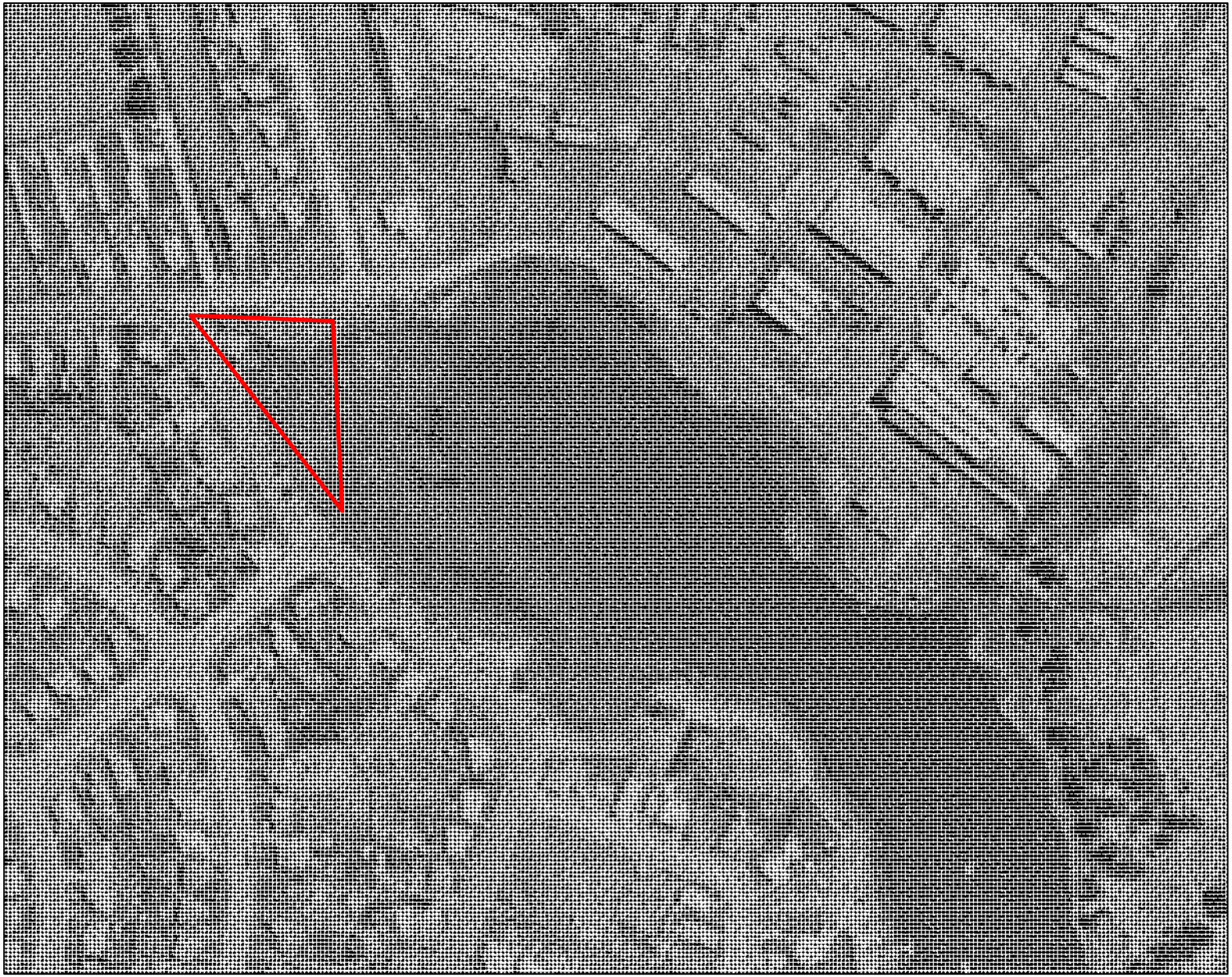

Plate 6 Historical Aerial Photograph, 1957 The Site and surrounding land (c/o DPIPWE)

Appendix 5 Chain of Custody (COC) and Sample Receipt Notification (SRN)

ALS Environmental

SAMPLE RECEIPT NOTIFICATION (SRN)

Work Order	: **EM2103194**		
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Peter Ravlic
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
E-mail	: jcumming@geosolutions.net.au	E-mail	: peter.ravlic@alsglobal.com
Telephone	: +61 03 6223 1839	Telephone	: +6138549 9545
Facsimile	: +61 03 6223 4539	Facsimile	: +61-3-8549 9626
Project	: G Wood	Page	: 1 of 3
Order number	: ----	Quote number	: EB2017GEOENVSOL0001 (EN/222)
C-O-C number	: ----	QC Level	: NEPM 2013 B3 & ALS QC Standard
Site	: ----		
Sampler	: MD, SJ		

Dates

Date Samples Received	: 26-Feb-2021 22:35	Issue Date	: 27-Feb-2021
Client Requested Due Date	: 05-Mar-2021	Scheduled Reporting Date	: **05-Mar-2021**

Delivery Details

Mode of Delivery	: Carrier	Security Seal	: Intact.
No. of coolers/boxes	: 1	Temperature	: 3.1 - Ice Bricks present
Receipt Detail	:	No. of samples received / analysed	: 13 / 12

General Comments

- This report contains the following information:
  - Sample Container(s)/Preservation Non-Compliances
  - Summary of Sample(s) and Requested Analysis
  - Proactive Holding Time Report
  - Requested Deliverables
- **Please direct any queries related to sample condition / numbering / breakages to Client Services.**
- Sample Disposal - Aqueous (3 weeks), Solid (2 months) from receipt of samples.
- **Analytical work for this work order will be conducted at ALS Springvale.**
- **Please refer to the Proactive Holding Time Report table below which summarises breaches of recommended holding times that have occurred prior to samples/instructions being received at the laboratory. The absence of this summary table indicates that all samples have been received within the recommended holding times for the analysis requested.**
- Please be aware that APHA/NEPM recommends water and soil samples be chilled to less than or equal to 6°C for chemical analysis, and less than or equal to 10°C but unfrozen for Microbiological analysis. Where samples are received above this temperature, it should be taken into consideration when interpreting results. Refer to ALS EnviroMail 85 for ALS recommendations of the best practice for chilling samples after sampling and for maintaining a cool temperature during transit.

RIGHT SOLUTIONS | RIGHT PARTNER

Issue Date	: 27-Feb-2021
Page	: 2 of 3
Work Order	: EM2103194 Amendment 0
Client	: GEO-ENVIRONMENTAL SOLUTIONS

Sample Container(s)/Preservation Non-Compliances

All comparisons are made against pretreatment/preservation AS, APHA, USEPA standards.

- **No sample container / preservation non-compliance exists.**

Summary of Sample(s) and Requested Analysis

Some items described below may be part of a laboratory process necessary for the execution of client requested tasks. Packages may contain additional analyses, such as the determination of moisture content and preparation tasks, that are included in the package.
If no sampling time is provided, the sampling time will default 00:00 on the date of sampling. If no sampling date is provided, the sampling date will be assumed by the laboratory and displayed in brackets without a time component

Matrix: **SOIL**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	(On Hold) SOIL - No analysis requested	SOIL - EA001 - pH (CaCl)	SOIL - EA055-103 - Moisture Content	SOIL - S-03 - 15 Metals (NEPM 2013 Suite - incl. Digestion)	SOIL - S-07 - TRH/BTEX/NPAH (SIM)
EM2103194-001	24-Feb-2021 00:00	BH01 0.2-0.3			✓	✓	✓
EM2103194-002	24-Feb-2021 00:00	BH01 0.8-0.9			✓	✓	✓
EM2103194-003	24-Feb-2021 00:00	BH01 1.5-1.6		✓	✓	✓	✓
EM2103194-004	24-Feb-2021 00:00	BH02 0.2-0.3		✓	✓	✓	✓
EM2103194-005	24-Feb-2021 00:00	BH02 0.8-0.9	✓				
EM2103194-006	24-Feb-2021 00:00	BH02 1.0-1.2			✓	✓	✓
EM2103194-007	24-Feb-2021 00:00	BH03 0.2-0.3			✓	✓	✓
EM2103194-008	24-Feb-2021 00:00	BH03 0.8-0.9			✓	✓	✓
EM2103194-009	24-Feb-2021 00:00	BH04 0.2-0.3		✓	✓	✓	✓
EM2103194-010	24-Feb-2021 00:00	BH04 0.4-0.5		✓	✓	✓	✓
EM2103194-011	24-Feb-2021 00:00	BH05 0.2-0.3		✓	✓	✓	✓
EM2103194-012	24-Feb-2021 00:00	Dup		✓	✓	✓	✓

Matrix: **WATER**

Laboratory sample ID	*Sampling date / time*	*Sample ID*	WATER - W-03 - 15 Metals (NEPM Suite)	WATER - W-07 - TRH/BTEX/NPAH
EM2103194-013	24-Feb-2021 00:00	Rinsate	✓	✓

Proactive Holding Time Report

Sample(s) have been received within the recommended holding times for the requested analysis.

Issue Date	: 27-Feb-2021
Page	: 3 of 3
Work Order	: EM2103194 Amendment 0
Client	: GEO-ENVIRONMENTAL SOLUTIONS

Requested Deliverables

All Invoices		
- A4 - AU Tax Invoice (INV)	Email	smcintosh@geosolutions.net.au
JOHN PAUL CUMMING		
- *AU Certificate of Analysis - NATA (COA)	Email	jcumming@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	jcumming@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	jcumming@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	jcumming@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	jcumming@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	jcumming@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	jcumming@geosolutions.net.au
- EDI Format - ESDAT (ESDAT)	Email	jcumming@geosolutions.net.au
M IRAN		
- A4 - AU Tax Invoice (INV)	Email	miran@geosolutions.net.au
SARAH JOYCE		
- *AU Certificate of Analysis - NATA (COA)	Email	sjoyce@geosolutions.net.au
- *AU Interpretive QC Report - DEFAULT (Anon QCI Rep) (QCI)	Email	sjoyce@geosolutions.net.au
- *AU QC Report - DEFAULT (Anon QC Rep) - NATA (QC)	Email	sjoyce@geosolutions.net.au
- A4 - AU Sample Receipt Notification - Environmental HT (SRN)	Email	sjoyce@geosolutions.net.au
- A4 - AU Tax Invoice (INV)	Email	sjoyce@geosolutions.net.au
- Chain of Custody (CoC) (COC)	Email	sjoyce@geosolutions.net.au
- EDI Format - ENMRG (ENMRG)	Email	sjoyce@geosolutions.net.au
- EDI Format - ESDAT (ESDAT)	Email	sjoyce@geosolutions.net.au

FREIGHT

ALS Environmental

MELBOURNE 2-4 Westall Road Springvale VIC 3171
PH: 03 8549 9600 E: samples.melbourne@alsglobal.com

SYDNEY 277-289 Woodpark Road Smithfield NSW
PH=02-8784 8555 E: samples.sydney@alsglobal.com

CLIENT:	GEOENVIRONMENTAL SOLUTIONS	TURNAROUND REQUIREMENTS: (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	★ Standard TAT (List due date): ☐ Non Standard or urgent TAT (List due date):
OFFICE:	29 Kirksway Pl, Battery Point TAS 7004		
PROJECT:	G Wood	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: (1) 2 3 4 5 6 7
ORDER NUMBER:			COC: 1 (2) 3 4 5 6 7
PROJECT MANAGER:	JP Cumming	CONTACT PH:	
SAMPLER:	Sarah Joyce / H Mark Dowdale	SAMPLER MOBILE: 0438 255 259	RELINQUISHED BY: S. Joyce
COC emailed to ALS? (YES / NO)		EDD FORMAT: default	DATE/TIME: 25·2·21
Email Reports to	jcumming@geosolutions.net.au; sjoyce@geosolutions.net.au		RECEIVED BY: / DATE/TIME: / RELINQUISHED BY: / DATE/TIME: / RECEIVED BY: / DATE/TIME:
Email Invoice to	jcumming@geosolutions.net.au; miran@geosolutions.net.au, sjoyce@geosolutions.net.au		

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where **Metals** are required, specify **Total** (unfiltered bottle required) or **Dissolved** (field filtered bottle required).

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TPH, BTEX, PAH	15 Metals	B Metals	Tas EPA IB105 (no TBT)	LOW LOR B(a)p	TRH C6 - C10	HOLD	pH	Additional Information
1	BH01 0·2-0·3	24·2·21	S	Jar	1	✓	✓							
2	BH01 0·8-0·9				1	✓	✓							
3	BH01 1·5-1·6				1	✓	✓						✓	
4	BH02 0·2-0·3				1	✓	✓						✓	
5	BH02 0·8-0·9				1							✓		
6	BH02 1·0-1·2				1	✓	✓							
7	BH03 0·2-0·3				1	✓	✓							
8	BH03 0·8-0·9				1	✓	✓							
9	BH04 0·2-0·3				1	✓	✓						✓	
10	BH04 0·4-0·5				1	✓	✓						✓	
11	BH05 0·2-0·3	↓	↓	↓	1	✓	✓						✓	
				TOTAL										

Environmental Division
Melbourne
Work Order Reference
EM2103194

Telephone : +61-3-8549 9600

Received: 26/2 0035 Carrier TASCAS
C/note 863580
Temp: 3.1 Cool / Ambient
Ice / Icebrick / N/A

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic; V = VOA Vial HCl Preserved; VS = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass; Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

ALS Environmental

SYDNEY 277-289 Woodpark Road Smithfield NSW Ph:02 8784 8555 E: samples.sydney@alsglobal.com

MELBOURNE 2-4 Westall Road Springvale VIC 3171 PH: 03 8549 9600 E: samples.melbourne@alsglobal.com

CLIENT:	GEOENVIRONMENTAL SOLUTIONS	TURNAROUND REQUIREMENTS : (Standard TAT may be longer for some tests e.g. Ultra Trace Organics)	★ Standard TAT (List due date); ☐ Non Standard or urgent TAT (List due date):
OFFICE:	29 Kirksway Pl, Battery Point TAS 7004		
PROJECT:	G'wood	ALS QUOTE NO.:	COC SEQUENCE NUMBER (Circle) COC: 1 (2) 3 4 5 6 7 SF: 1 (2) 3 4 5 6 7
ORDER NUMBER:			
PROJECT MANAGER:	JP Cumming	CONTACT PH:	
SAMPLER:	Sarah Joyce	SAMPLER MOBILE: 0438 255 259	
COC emailed to ALS? (YES / NO)		EDD FORMAT: default	
Email Reports to jcumming@geosolutions.net.au; sjoyce@geosolutions.net.au			
Email Invoice to jcumming@geosolutions.net.au; miran@geosolutions.net.au, sjoyce@geosolutions.net.au			

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
S. Joyce			
DATE/TIME: 25.2.21	DATE/TIME:	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL:

ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).

LAB ID	SAMPLE ID	DATE / TIME	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS	TPH, BTEX, PAH	15 Metals	8 Metals	Tas EPA IB105 (no TBT)	LOW LOR B(a)p	TRH C6 - C10	HOLD	pH	Additional Information
12	Dup	24.2.21	S	Jar	1	✓	✓						✓	
13	Rinsate	1	W	2V 1P 1A	4	✓	✓							
				TOTAL										

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP - Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VS = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfuric Preserved Plastic; F = Formaldehyde Preserved Glass;
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Appendix 6 Quality Assurance and Quality Control

Duplicate Comparrison	Sample	Arsenic	Barium	Beryllium	Cadmium	Chromium Total	Cobalt	Copper	Lead	Manganese	Nickel	Zinc	Mercury	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	Sum of polycyclic aromatic hydr	Benzo(a)pyrene TEQ (WHO)	Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Sum of BTEX	Total Xylenes	Naphthalene	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C6 - C10 Fraction	F1	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	F2	Benzo(a)pyrene TEQ (half LOR)	Benzo(a)pyrene TEQ (LOR)
Unit		mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg
LOR		5	10	1	1	2	2	5	5	5	2	5	0.1	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.2	0.5	0.5	0.5	0.5	0.2	0.5	1	10	50	100	100	50	10	10	50	100	100	50	50	0.5	0.5
24/02/2021	BH02 0.2-0.3	<5	60	<1	<1	8	6	6	17	201	5	45	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	0.6	1.2
24/02/2021	Dup	<5	60	<1	<1	7	9	6	19	322	6	53	<0.1	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<0.5	<0.5	<0.5	<0.2	<0.5	<1	<10	<50	<100	<100	<50	<10	<10	<50	<100	<100	<50	<50	0.6	1.2
Relative Percentage Difference (RPD) %		NA	0.0	NA	NA	13.3	40.0	0.0	11.1	46.3	18.2	16.3	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	0.0	0.0
RPD Compliance Limit %		NA	50	NA	NA	50	50	NA	50	30	50	50	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	50
Method Detection Limit (MDL)		NA	200	NA	NA	40	40	NA	100	500	40	100	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	10
MDL Class		NONE	LOW	NONE	NONE	LOW	LOW	NONE	LOW	MED	LOW	LOW	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	NONE	LOW
RPD Compliance With MDL?	56/57 (98%)	YES	YES	YES	YES	YES	YES	YES	YES	NO	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

For BH02 0.2-0.3 and Dup pairs, 98% of analytes complied.

Quality Control Blanks		Arsenic	Beryllium	Barium	Cadmium	Chromium	Cobalt	Copper	Lead	Manganese	Nickel	Selenium	Vanadium	Zinc	Boron	Mercury	Benzene	Toluene	Ethylbenzene	meta- & para-Xylene	ortho-Xylene	Total Xylenes	Sum of BTEX	Naphthalene	C6 - C9 Fraction	C10 - C14 Fraction	C15 - C28 Fraction	C29 - C36 Fraction	C10 - C36 Fraction (sum)	C6 - C10 Fraction	C6 - C10 Fraction minus BTEX (F1)	>C10 - C16 Fraction	>C16 - C34 Fraction	>C34 - C40 Fraction	>C10 - C40 Fraction (sum)	>C10 - C16 Fraction minus Naphthalene (F2)	Naphthalene	Acenaphthylene	Acenaphthene	Fluorene	Phenanthrene	Anthracene	Fluoranthene	Pyrene	Benz(a)anthracene	Chrysene	Benzo(b+j)fluoranthene	Benzo(k)fluoranthene	Benzo(a)pyrene	Indeno(1.2.3.cd)pyrene	Dibenz(a.h)anthracene	Benzo(g.h.i)perylene	Sum of polycyclic aromatic hydrocarbons	Benzo(a)pyrene TEQ (zero)
Unit		mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L	µg/L
LOR		0.001	0.001	0.001	0.0001	0.001	0.001	0.001	0.001	0.001	0.001	0.01	0.01	0.005	0.05	0.0001	1	2	2	2	2	2	1	5	20	50	100	50	50	20	20	100	100	100	100	100	1	1	1	1	1	1	1	1	1	1	1	1	0.5	1	1	1	0.5	0.5
Date	Sample																																																					
24/02/2021	Rinsate	<0.001	<0.001	<0.001	<0.0001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.01	<0.01	<0.005	<0.05	<0.0001	<1	<2	<2	<2	<2	<2	<1	<5	<20	<50	<100	<50	<50	<20	<20	<100	<100	<100	<100	<100	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<0.5	<1.0	<1.0	<1.0	<0.5	<0.5

ALS Environmental

QUALITY CONTROL REPORT

Work Order	: EM2103194	Page	: 1 of 12
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Peter Ravlic
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61385499645
Project	: G Wood	Date Samples Received	: 26-Feb-2021
Order number	: ---	Date Analysis Commenced	: 01-Mar-2021
C-O-C number	: ---	Issue Date	: 04-Mar-2021
Sampler	: MD, SJ		
Site	: ---		
Quote number	: EN/222		
No. of samples received	: 13		
No. of samples analysed	: 12		

ilac-MRA NATA

Accreditation No. 825
Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Quality Control Report contains the following information:

- Laboratory Duplicate (DUP) Report; Relative Percentage Difference (RPD) and Acceptance Limits
- Method Blank (MB) and Laboratory Control Spike (LCS) Report; Recovery and Acceptance Limits
- Matrix Spike (MS) Report; Recovery and Acceptance Limits

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Arenie Vijayaratnam	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

ALS

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis. Where the LOR of a reported result differs from standard LOR, this may be due to high

Key : Anonymous = Refers to samples which are not specifically part of this work order but formed part of the QC process lot
CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
RPD = Relative Percentage Difference
# = Indicates failed QC

Laboratory Duplicate (DUP) Report

The quality control term Laboratory Duplicate refers to a randomly selected intralaboratory split. Laboratory duplicates provide information regarding method precision and sample heterogeneity. The permitted ranges for the Relative Percent Deviation (RPD) of Laboratory Duplicates are specified in ALS Method QW/-EN/38 and are dependent on the magnitude of results in comparison to the level of reporting: Result < 10 times LOR: No Limit; Result between 10 and 20 times LOR: 0% - 50%; Result > 20 times LOR: 0% - 20%.

Sub-Matrix: SOIL

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report: Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3538527)									
EM2103184-001	Anonymous	EG005T: Beryllium	7440-41-7	1	mg/kg	1	1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	30	40	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	46	47	0.00	0% - 20%
		EG005T: Cobalt	7440-48-4	2	mg/kg	17	20	12.3	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	29	30	0.00	0% - 50%
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	13	14	8.86	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	13	13	0.00	No Limit
		EG005T: Manganese	7439-96-5	5	mg/kg	211	227	7.29	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Vanadium	7440-62-2	5	mg/kg	62	63	0.00	0% - 50%
		EG005T: Zinc	7440-66-6	5	mg/kg	26	26	0.00	No Limit
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EM2103194-007	BH03 0.2-0.3	EG005T: Beryllium	7440-41-7	1	mg/kg	<1	<1	0.00	No Limit
		EG005T: Cadmium	7440-43-9	1	mg/kg	2	2	0.00	No Limit
		EG005T: Barium	7440-39-3	10	mg/kg	60	60	0.00	No Limit
		EG005T: Chromium	7440-47-3	2	mg/kg	12	12	0.00	No Limit
		EG005T: Cobalt	7440-48-4	2	mg/kg	8	7	0.00	No Limit
		EG005T: Nickel	7440-02-0	2	mg/kg	10	10	0.00	No Limit
		EG005T: Arsenic	7440-38-2	5	mg/kg	<5	<5	0.00	No Limit
		EG005T: Copper	7440-50-8	5	mg/kg	17	15	13.0	No Limit
		EG005T: Lead	7439-92-1	5	mg/kg	60	66	8.77	0% - 50%
		EG005T: Manganese	7439-96-5	5	mg/kg	211	193	8.74	0% - 20%
		EG005T: Selenium	7782-49-2	5	mg/kg	<5	<5	0.00	No Limit

Page : 3 of 12
Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Sub-Matrix: SOIL

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report: Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG005(ED093)T: Total Metals by ICP-AES (QC Lot: 3538527) - continued									
EM2103194-007	BH03 0.2-0.3	EG005T: Vanadium	7440-62-2	5	mg/kg	24	24	0.00	No Limit
		EG005T: Zinc	7440-66-6	5	mg/kg	395	371	6.14	0% - 20%
		EG005T: Boron	7440-42-8	50	mg/kg	<50	<50	0.00	No Limit
EA001: pH in soil using 0.01M CaCl extract (QC Lot: 3539844)									
EM2103173-010	Anonymous	EA001: pH (CaCl2)	---	0.1	pH Unit	6.6	6.6	0.00	0% - 20%
EM2103173-019	Anonymous	EA001: pH (CaCl2)	---	0.1	pH Unit	6.3	6.3	0.00	0% - 20%
EA001: pH in soil using 0.01M CaCl extract (QC Lot: 3539845)									
EM2103194-009	BH04 0.2-0.3	EA001: pH (CaCl2)	---	0.1	pH Unit	7.3	7.2	1.38	0% - 20%
EM2103228-006	Anonymous	EA001: pH (CaCl2)	---	0.1	pH Unit	6.6	6.6	0.00	0% - 20%
EA055: Moisture Content (Dried @ 105-110°C) (QC Lot: 3539672)									
EM2103182-024	Anonymous	EA055: Moisture Content	---	0.1	%	16.4	17.1	4.15	0% - 50%
EM2103194-008	BH03 0.8-0.9	EA055: Moisture Content	---	0.1	%	11.7	13.0	10.2	0% - 50%
EG035T: Total Recoverable Mercury by FIMS (QC Lot: 3538526)									
EM2103194-001	Anonymous	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EM2103194-007	BH03 0.2-0.3	EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	<0.1	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3538778)									
EM2103194-001	BH01 0.2-0.3	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EM2103194-012	Dup	EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	<0.5	0.00	No Limit

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Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Sub-Matrix: SOIL

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report: Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3538778) - continued									
EM2103194-012	Dup	EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3536346)									
EM2103015-001	Anonymous	EP080: C6 - C9 Fraction	---	10	mg/kg	60	53	13.1	No Limit
EM2103194-008	BH03 0.8-0.9	EP080: C6 - C9 Fraction	---	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3538779)									
EM2103194-001	BH01 0.2-0.3	EP071: C15 - C28 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	---	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	---	50	mg/kg	<50	<50	0.00	No Limit
EM2103194-012	Dup	EP071: C15 - C28 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C29 - C36 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: C10 - C14 Fraction	---	50	mg/kg	<50	<50	0.00	No Limit
		EP071: C10 - C36 Fraction (sum)	---	50	mg/kg	<50	<50	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3536346)									
EM2103015-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	117	106	9.92	0% - 50%
EM2103194-008	BH03 0.8-0.9	EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	<10	0.00	No Limit
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3538778)									
EM2103194-001	BH01 0.2-0.3	EP071: >C16 - C34 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	---	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	---	50	mg/kg	<50	<50	0.00	No Limit
EM2103194-012	Dup	EP071: >C16 - C34 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C34 - C40 Fraction	---	100	mg/kg	<100	<100	0.00	No Limit
		EP071: >C10 - C16 Fraction	---	50	mg/kg	<50	<50	0.00	No Limit
		EP071: >C10 - C40 Fraction (sum)	---	50	mg/kg	<50	<50	0.00	No Limit
EP080: BTEXN (QC Lot: 3536346)									
EM2103015-001	Anonymous	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	1.5	1.3	14.0	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	3.2	2.8	11.7	No Limit

Page : 5 of 12
Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Sub-Matrix: SOIL

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report: Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 3536346) - continued									
EM2103018-001	Anonymous	EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	16.2	13.6	10.8	0% - 20%
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	5.6	5.1	10.2	0% - 50%
		EP080: Naphthalene	91-20-3	1	mg/kg	3	3	0.00	No Limit
EM2103194-008	BH03 0.8-0.9	EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	<0.2	0.00	No Limit
		EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	<0.5	0.00	No Limit
		EP080: Naphthalene	91-20-3	1	mg/kg	<1	<1	0.00	No Limit

Sub-Matrix: WATER

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report: Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3541788)									
EM2103255-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.283	0.284	7.51	0% - 20%
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.005	0.005	0.00	No Limit
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.003	0.003	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	0.002	0.002	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.009	0.009	0.00	No Limit
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.006	0.006	0.00	No Limit
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.006	0.009	39.0	No Limit
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	0.09	0.08	0.00	No Limit
EM2103144-001	Anonymous	EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	0.0001	<0.0001	0.00	No Limit
		EG020A-F: Arsenic	7440-38-2	0.001	mg/L	0.001	0.001	0.00	No Limit
		EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Barium	7440-39-3	0.001	mg/L	0.123	0.124	0.00	0% - 20%
		EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Cobalt	7440-48-4	0.001	mg/L	0.026	0.026	0.00	0% - 20%
		EG020A-F: Copper	7440-50-8	0.001	mg/L	0.007	0.006	0.00	No Limit
		EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	<0.001	0.00	No Limit
		EG020A-F: Manganese	7439-96-5	0.001	mg/L	0.201	0.202	0.553	0% - 20%
		EG020A-F: Nickel	7440-02-0	0.001	mg/L	0.074	0.074	0.00	0% - 20%
		EG020A-F: Zinc	7440-66-6	0.005	mg/L	0.112	0.115	2.77	0% - 20%
		EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit

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Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Sub-Matrix: WATER

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report: Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EG020F: Dissolved Metals by ICP-MS (QC Lot: 3541788) - continued									
EM2103144-001	Anonymous	EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	<0.01	0.00	No Limit
		EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	<0.05	0.00	No Limit
EG035F: Dissolved Mercury by FIMS (QC Lot: 3541790)									
EM2103311-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EM2103144-001	Anonymous	EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	<0.0001	0.00	No Limit
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QC Lot: 3541075)									
EM2103188-001	Anonymous	EP075(SIM): Benzo(a)pyrene	50-32-8	0.5	µg/L	<0.5	<0.5	0.00	No Limit
		EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Benzo(a)anthracene	56-55-3	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Benzo[b+j]fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Benzo(k)fluoranthene	207-08-9	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Indeno(1.2.3.cd)pyrene	193-39-5	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Dibenz[a,h]anthracene	53-70-3	1	µg/L	<1.0	<1.0	0.00	No Limit
		EP075(SIM): Benzo[g,h,i]perylene	191-24-2	1	µg/L	<1.0	<1.0	0.00	No Limit
EP080/071: Total Petroleum Hydrocarbons (QC Lot: 3535968)									
EM2103220-001	Anonymous	EP080: C6 - C9 Fraction	---	20	µg/L	80	80	0.00	No Limit
EM2103121-002	Anonymous	EP080: C6 - C9 Fraction	---	20	µg/L	1730	1780	2.76	0% - 20%
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QC Lot: 3535968)									
EM2103220-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	80	70	0.00	No Limit
EM2103121-002	Anonymous	EP080: C6 - C10 Fraction	C6_C10	20	µg/L	1660	1710	3.04	0% - 20%
EP080: BTEXN (QC Lot: 3535968)									
EM2103121-002	Anonymous	EP080: Benzene	71-43-2	1	µg/L	812	798	1.67	0% - 20%
EM2103220-001	Anonymous	EP080: Benzene	71-43-2	1	µg/L	<1	<1	0.00	No Limit
		EP080: Toluene	108-88-3	2	µg/L	4	4	0.00	No Limit
		EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	<2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	<2	<2	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit
EM2103121-002	Anonymous	EP080: Toluene	108-88-3	2	µg/L	3	3	0.00	No Limit

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Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Sub-Matrix: WATER

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	LOR	Unit	Laboratory Duplicate (DUP) Report: Original Result	Duplicate Result	RPD (%)	Recovery Limits (%)
EP080: BTEXN (QC Lot: 3535968) - continued									
EM2103121-002	Anonymous	EP080: Ethylbenzene	100-41-4	2	µg/L	<2	<2	0.00	No Limit
		EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	2	2	0.00	No Limit
		EP080: ortho-Xylene	95-47-6	2	µg/L	3	3	0.00	No Limit
		EP080: Naphthalene	91-20-3	5	µg/L	<5	<5	0.00	No Limit

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Method Blank (MB) and Laboratory Control Spike (LCS) Report

The quality control term Method / Laboratory Blank refers to an analyte free matrix to which all reagents are added in the same volumes or proportions as used in standard sample preparation. The purpose of this QC parameter is to monitor potential laboratory contamination. The quality control term Laboratory Control Spike (LCS) refers to a certified reference material, or a known interference free matrix spiked with target analytes. The purpose of this QC parameter is to monitor method precision and accuracy independent of sample matrix. Dynamic Recovery Limits are based on statistical evaluation of processed LCS.

Sub-Matrix: SOIL

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3538527)								
EG005T: Arsenic	7440-38-2	5	mg/kg	<5	123 mg/kg	101	70.0	130
EG005T: Barium	7440-39-3	10	mg/kg	<10	99.3 mg/kg	95.7	70.0	130
EG005T: Beryllium	7440-41-7	1	mg/kg	<1	0.67 mg/kg	95.6	70.0	130
EG005T: Boron	7440-42-8	50	mg/kg	<50	---	---	---	---
EG005T: Cadmium	7440-43-9	1	mg/kg	<1	1.23 mg/kg	83.2	50.0	130
EG005T: Chromium	7440-47-3	2	mg/kg	<2	20.2 mg/kg	106	70.0	130
EG005T: Cobalt	7440-48-4	2	mg/kg	<2	11.2 mg/kg	93.6	70.0	130
EG005T: Copper	7440-50-8	5	mg/kg	<5	55.9 mg/kg	96.2	70.0	130
EG005T: Lead	7439-92-1	5	mg/kg	<5	62.4 mg/kg	93.7	70.0	130
EG005T: Manganese	7439-96-5	5	mg/kg	<5	590 mg/kg	94.2	70.0	130
EG005T: Nickel	7440-02-0	2	mg/kg	<2	15.4 mg/kg	103	70.0	130
EG005T: Selenium	7782-49-2	5	mg/kg	<5	---	---	---	---
EG005T: Vanadium	7440-62-2	5	mg/kg	<5	61.3 mg/kg	104	70.0	130
EG005T: Zinc	7440-66-6	5	mg/kg	<5	162 mg/kg	78.6	70.0	130
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3538526)								
EG035T: Mercury	7439-97-6	0.1	mg/kg	<0.1	0.64 mg/kg	88.3	70.0	130
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3538778)								
EP075(SIM): Naphthalene	91-20-3	0.5	mg/kg	<0.5	3 mg/kg	108	85.7	123
EP075(SIM): Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	3 mg/kg	100.0	81.0	123
EP075(SIM): Acenaphthene	83-32-9	0.5	mg/kg	<0.5	3 mg/kg	104	83.6	120
EP075(SIM): Fluorene	86-73-7	0.5	mg/kg	<0.5	3 mg/kg	98.8	81.3	126
EP075(SIM): Phenanthrene	85-01-8	0.5	mg/kg	<0.5	3 mg/kg	104	79.4	123
EP075(SIM): Anthracene	120-12-7	0.5	mg/kg	<0.5	3 mg/kg	108	81.7	127
EP075(SIM): Fluoranthene	206-44-0	0.5	mg/kg	<0.5	3 mg/kg	103	78.3	124
EP075(SIM): Pyrene	129-00-0	0.5	mg/kg	<0.5	3 mg/kg	106	79.9	128
EP075(SIM): Benz[a]anthracene	56-55-3	0.5	mg/kg	<0.5	3 mg/kg	101	76.9	123
EP075(SIM): Chrysene	218-01-9	0.5	mg/kg	<0.5	3 mg/kg	107	80.9	130
EP075(SIM): Benzo[b+j]fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	3 mg/kg	85.1	72.0	121
EP075(SIM): Benzo[k]fluoranthene	207-08-9	0.5	mg/kg	<0.5	3 mg/kg	90.4	80.4	130
EP075(SIM): Benzo[a]pyrene	50-32-8	0.5	mg/kg	<0.5	3 mg/kg	81.0	70.2	123
EP075(SIM): Indeno[1,2,3-cd]pyrene	193-39-5	0.5	mg/kg	<0.5	3 mg/kg	78.4	67.9	122
EP075(SIM): Dibenz[a,h]anthracene	53-70-3	0.5	mg/kg	<0.5	3 mg/kg	76.0	65.8	123
EP075(SIM): Benzo[g,h,i]perylene	191-24-2	0.5	mg/kg	<0.5	3 mg/kg	83.0	65.8	127

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Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Sub-Matrix: **SOIL**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3536346)								
EP080: C6 - C9 Fraction	---	10	mg/kg	<10	36 mg/kg	109	58.6	131
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3538779)								
EP071: C10 - C14 Fraction	---	50	mg/kg	<50	900 mg/kg	86.0	75.0	128
EP071: C15 - C28 Fraction	---	100	mg/kg	<100	3030 mg/kg	96.4	82.0	123
EP071: C29 - C36 Fraction	---	100	mg/kg	<100	1520 mg/kg	86.6	82.4	121
EP071: C10 - C36 Fraction (sum)	---	50	mg/kg	<50	---	---	---	---
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3536346)								
EP080: C6 - C10 Fraction	C6_C10	10	mg/kg	<10	45 mg/kg	101	58.3	128
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3538779)								
EP071: >C10 - C16 Fraction	---	50	mg/kg	<50	1160 mg/kg	101	77.0	130
EP071: >C16 - C34 Fraction	---	100	mg/kg	<100	4020 mg/kg	96.9	81.5	120
EP071: >C34 - C40 Fraction	---	100	mg/kg	<100	280 mg/kg	96.0	73.3	137
EP071: >C10 - C40 Fraction (sum)	---	50	mg/kg	<50	---	---	---	---
EP080: BTEXN (QCLot: 3536346)								
EP080: Benzene	71-43-2	0.2	mg/kg	<0.2	2 mg/kg	95.5	61.6	117
EP080: Toluene	108-88-3	0.5	mg/kg	<0.5	2 mg/kg	111	65.8	125
EP080: Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	2 mg/kg	106	65.8	124
EP080: meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	4 mg/kg	113	64.8	134
EP080: ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	2 mg/kg	109	68.7	132
EP080: Naphthalene	91-20-3	1	mg/kg	<1	0.5 mg/kg	99.8	61.8	123

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3541788)								
EG020A-F: Arsenic	7440-38-2	0.001	mg/L	<0.001	0.1 mg/L	108	89.0	111
EG020A-F: Beryllium	7440-41-7	0.001	mg/L	<0.001	0.1 mg/L	109	85.0	112
EG020A-F: Barium	7440-39-3	0.001	mg/L	<0.001	0.1 mg/L	106	83.6	113
EG020A-F: Cadmium	7440-43-9	0.0001	mg/L	<0.0001	0.1 mg/L	106	83.5	111
EG020A-F: Chromium	7440-47-3	0.001	mg/L	<0.001	0.1 mg/L	96.4	83.2	109
EG020A-F: Cobalt	7440-48-4	0.001	mg/L	<0.001	0.1 mg/L	102	84.3	110
EG020A-F: Copper	7440-50-8	0.001	mg/L	<0.001	0.1 mg/L	100	83.1	107
EG020A-F: Lead	7439-92-1	0.001	mg/L	<0.001	0.1 mg/L	100	84.6	108
EG020A-F: Manganese	7439-96-5	0.001	mg/L	<0.001	0.1 mg/L	96.1	84.8	110
EG020A-F: Nickel	7440-02-0	0.001	mg/L	<0.001	0.1 mg/L	103	84.3	110
EG020A-F: Selenium	7782-49-2	0.01	mg/L	<0.01	0.1 mg/L	104	82.3	113
EG020A-F: Vanadium	7440-62-2	0.01	mg/L	<0.01	0.1 mg/L	99.3	83.7	110
EG020A-F: Zinc	7440-66-6	0.005	mg/L	<0.005	0.1 mg/L	107	86.3	112

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Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	Spike Recovery (%): LCS	Recovery Limits (%): Low	Recovery Limits (%): High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3541788) - continued								
EG020A-F: Boron	7440-42-8	0.05	mg/L	<0.05	0.5 mg/L	108	85.4	115
EG035F: Dissolved Mercury by FIMS (QCLot: 3541790)								
EG035F: Mercury	7439-97-6	0.0001	mg/L	<0.0001	0.01 mg/L	89.1	71.6	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3541975)								
EP075(SIM): Naphthalene	91-20-3	1	µg/L	<1.0	5 µg/L	89.2	42.8	114
EP075(SIM): Acenaphthylene	208-96-8	1	µg/L	<1.0	5 µg/L	92.4	48.6	119
EP075(SIM): Acenaphthene	83-32-9	1	µg/L	<1.0	5 µg/L	95.1	47.0	117
EP075(SIM): Fluorene	86-73-7	1	µg/L	<1.0	5 µg/L	97.0	49.5	119
EP075(SIM): Phenanthrene	85-01-8	1	µg/L	<1.0	5 µg/L	97.4	49.4	121
EP075(SIM): Anthracene	120-12-7	1	µg/L	<1.0	5 µg/L	95.8	48.4	122
EP075(SIM): Fluoranthene	206-44-0	1	µg/L	<1.0	5 µg/L	96.2	50.3	124
EP075(SIM): Pyrene	129-00-0	1	µg/L	<1.0	5 µg/L	96.0	50.0	126
EP075(SIM): Benz[a]anthracene	56-55-3	1	µg/L	<1.0	5 µg/L	97.8	49.4	127
EP075(SIM): Chrysene	218-01-9	1	µg/L	<1.0	5 µg/L	99.8	48.7	126
EP075(SIM): Benzo[b+j]fluoranthene	205-99-2 205-82-3	1	µg/L	<1.0	5 µg/L	97.7	54.5	134
EP075(SIM): Benzo[k]fluoranthene	207-08-9	1	µg/L	<1.0	5 µg/L	97.2	56.1	134
EP075(SIM): Benzo[a]pyrene	50-32-8	0.5	µg/L	<0.5	5 µg/L	97.8	55.6	135
EP075(SIM): Indeno[1,2,3-cd]pyrene	193-39-5	1	µg/L	<1.0	5 µg/L	99.2	54.4	126
EP075(SIM): Dibenz[a,h]anthracene	53-70-3	1	µg/L	<1.0	5 µg/L	99.7	54.5	126
EP075(SIM): Benzo[g,h,i]perylene	191-24-2	1	µg/L	<1.0	5 µg/L	99.4	54.4	126
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3535968)								
EP080: C6 - C9 Fraction	---	20	µg/L	<20	360 µg/L	96.0	66.2	134
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3541976)								
EP071: C10 - C14 Fraction	---	50	µg/L	<50	5430 µg/L	99.4	44.2	140
EP071: C15 - C28 Fraction	---	100	µg/L	<100	18900 µg/L	115	46.9	127
EP071: C29 - C36 Fraction	---	50	µg/L	<50	9560 µg/L	113	47.4	128
EP071: C10 - C36 Fraction (sum)	---	---	µg/L	---	33900 µg/L	112	72.0	130
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3535968)								
EP080: C6 - C10 Fraction	C6_C10	20	µg/L	<20	450 µg/L	94.0	66.2	132
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3541976)								
EP071: >C10 - C16 Fraction	---	100	µg/L	<100	7190 µg/L	104	43.0	127
EP071: >C16 - C34 Fraction	---	100	µg/L	<100	25100 µg/L	110	48.8	129
EP071: >C34 - C40 Fraction	---	100	µg/L	<100	1790 µg/L	123	42.2	133
EP071: >C10 - C40 Fraction (sum)	---	---	µg/L	---	34100 µg/L	109	72.0	130
EP080: BTEXN (QCLot: 3535968)								
EP080: Benzene	71-43-2	1	µg/L	<1	20 µg/L	93.3	68.8	127
EP080: Toluene	108-88-3	2	µg/L	<2	20 µg/L	102	72.9	129

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Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Sub-Matrix: **WATER**

Method: Compound	CAS Number	LOR	Unit	Method Blank (MB) Report: Result	Laboratory Control Spike (LCS) Report: Spike Concentration	LCS	Recovery Limits (%): Low	High
EP080: BTEXN (QCLot: 3535968) - continued								
EP080: Ethylbenzene	100-41-4	2	µg/L	<2	20 µg/L	98.3	71.7	130
EP080: meta- & para-Xylene	108-38-3 106-42-3	2	µg/L	<2	40 µg/L	103	72.3	136
EP080: ortho-Xylene	95-47-6	2	µg/L	<2	20 µg/L	106	75.9	134
EP080: Naphthalene	91-20-3	5	µg/L	<5	5 µg/L	87.7	68.3	131

Matrix Spike (MS) Report

The quality control term Matrix Spike (MS) refers to an intralaboratory split sample spiked with a representative set of target analytes. The purpose of this QC parameter is to monitor potential matrix effects on analyte recoveries. Static Recovery Limits as per laboratory Data Quality Objectives (DQOs). Ideal recovery ranges stated may be waived in the event of sample matrix interference.

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	High
EG005(ED093)T: Total Metals by ICP-AES (QCLot: 3538527)							
EM2103194-002	Anonymous	EG005T: Arsenic	7440-38-2	50 mg/kg	80.5	76.0	124
		EG005T: Cadmium	7440-43-9	50 mg/kg	97.4	79.7	116
		EG005T: Chromium	7440-47-3	50 mg/kg	98.7	79.0	121
		EG005T: Copper	7440-50-8	250 mg/kg	98.3	80.0	120
		EG005T: Lead	7439-92-1	250 mg/kg	95.5	80.0	120
		EG005T: Nickel	7440-02-0	50 mg/kg	96.6	76.0	120
		EG005T: Zinc	7440-66-6	250 mg/kg	95.7	80.0	120
EG035T: Total Recoverable Mercury by FIMS (QCLot: 3538526)							
EM2103194-002	Anonymous	EG035T: Mercury	7439-97-6	0.5 mg/kg	96.6	76.0	116
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3538778)							
EM2103194-002	BH01 0.8-0.9	EP075(SIM): Acenaphthene	83-32-9	3 mg/kg	104	77.2	116
		EP075(SIM): Pyrene	129-00-0	3 mg/kg	106	65.5	136
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3536346)							
EM2103194-001	BH01 0.2-0.3	EP080: C6 - C9 Fraction	---	28 mg/kg	106	33.4	134
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3538779)							
EM2103194-003	BH01 1.5-1.6	EP071: C10 - C14 Fraction	---	900 mg/kg	99.8	71.2	135
		EP071: C15 - C28 Fraction	---	3030 mg/kg	97.4	75.8	122
		EP071: C29 - C36 Fraction	---	1520 mg/kg	98.6	76.0	120
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3536346)							
EM2103194-001	BH01 0.2-0.3	EP080: C6 - C10 Fraction	C6_C10	33 mg/kg	102	30.8	120
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3538779)							
EM2103194-003	BH01 1.5-1.6	EP071: >C10 - C16 Fraction	---	1160 mg/kg	103	72.2	128
		EP071: >C16 - C34 Fraction	---	4020 mg/kg	97.5	76.5	119

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Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Sub-Matrix: **SOIL**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	High
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3538779) - continued							
EM2103194-003	BH01 1.5-1.6	EP071: >C34 - C40 Fraction	---	280 mg/kg	95.6	66.8	136
EP080: BTEXN (QCLot: 3536346)							
EM2103194-001	BH01 0.2-0.3	EP080: Benzene	71-43-2	2 mg/kg	99.4	54.4	127
		EP080: Toluene	108-88-3	2 mg/kg	108	57.1	131

Sub-Matrix: **WATER**

Laboratory sample ID	Sample ID	Method: Compound	CAS Number	Matrix Spike (MS) Report: Spike Concentration	SpikeRecovery(%): MS	Recovery Limits (%): Low	High
EG020F: Dissolved Metals by ICP-MS (QCLot: 3541788)							
EM2103144-001	Anonymous	EG020A-F: Arsenic	7440-38-2	0.2 mg/L	110	76.8	124
		EG020A-F: Beryllium	7440-41-7	0.2 mg/L	100	73.0	120
		EG020A-F: Barium	7440-39-3	0.2 mg/L	96.0	76.0	127
		EG020A-F: Cadmium	7440-43-9	0.05 mg/L	102	74.8	118
		EG020A-F: Chromium	7440-47-3	0.2 mg/L	92.8	71.0	135
		EG020A-F: Cobalt	7440-48-4	0.2 mg/L	106	76.0	132
		EG020A-F: Copper	7440-50-8	0.2 mg/L	105	76.0	130
		EG020A-F: Lead	7439-92-1	0.2 mg/L	94.1	76.0	133
		EG020A-F: Manganese	7439-96-5	0.2 mg/L	86.0	64.0	134
		EG020A-F: Nickel	7440-02-0	0.2 mg/L	105	73.0	131
		EG020A-F: Vanadium	7440-62-2	0.2 mg/L	95.8	73.0	131
		EG020A-F: Zinc	7440-66-6	0.2 mg/L	106	76.0	131
EG035F: Dissolved Mercury by FIMS (QCLot: 3541796)							
EM2103145-001	Anonymous	EG035F: Mercury	7439-97-6	0.01 mg/L	81.6	70.0	120
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons (QCLot: 3541075)							
EM2103191-001	Anonymous	EP075(SIM): Acenaphthene	83-32-9	10 µg/L	75.3	39.3	123
		EP075(SIM): Pyrene	129-00-0	10 µg/L	80.9	44.0	124
EP080/071: Total Petroleum Hydrocarbons (QCLot: 3535968)							
EM2103144-001	Anonymous	EP080: C6 - C9 Fraction	---	280 µg/L	96.8	33.9	126
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions (QCLot: 3535968)							
EM2103144-001	Anonymous	EP080: C6 - C10 Fraction	C6_C10	330 µg/L	94.0	34.0	122
EP080: BTEXN (QCLot: 3535968)							
EM2103144-001	Anonymous	EP080: Benzene	71-43-2	20 µg/L	109	56.3	133
		EP080: Toluene	108-88-3	20 µg/L	113	60.4	132

ALS Environmental

QA/QC Compliance Assessment to assist with Quality Review

Work Order	: EM2103194	Page	: 1 of 9
Client	: GEO-ENVIRONMENTAL SOLUTIONS	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Telephone	: +6138549 9645
Project	: G Wood	Date Samples Received	: 26-Feb-2021
Site	: ----	Issue Date	: 04-Mar-2021
Sampler	: MD, SJ	No. of samples received	: 13
Order number	: ----	No. of samples analysed	: 12

This report is automatically generated by the ALS LIMS through interpretation of the ALS Quality Control Report and several Quality Assurance parameters measured by ALS. This automated reporting highlights any non-conformances, facilitates faster and more accurate data validation and is designed to assist internal expert and external Auditor review. Many components of this report contribute to the overall DQO assessment and reporting for guideline compliance.

Brief method summaries and references are also provided to assist in traceability.

Summary of Outliers

Outliers : Quality Control Samples

This report highlights outliers flagged in the Quality Control (QC) Report.

- **NO Method Blank value outliers occur.**
- **NO Duplicate outliers occur.**
- **NO Laboratory Control outliers occur.**
- **NO Matrix Spike outliers occur.**
- **For all regular sample matrices, NO surrogate recovery outliers occur.**

Outliers : Analysis Holding Time Compliance

- **NO Analysis Holding Time Outliers exist.**

Outliers : Frequency of Quality Control Samples

- **Quality Control Sample Frequency Outliers exist - please see following pages for full details.**

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Outliers : Frequency of Quality Control Samples

Matrix: **WATER**

Quality Control Sample Type	Count		Rate (%)		Quality Control Specification
Method	QC	Regular	Actual	Expected	
Laboratory Duplicates (DUP)					
TRH - Semivolatile Fraction	0	17	0.00	10.00	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)					
TRH - Semivolatile Fraction	0	17	0.00	5.00	NEPM 2013 B3 & ALS QC Standard

Analysis Holding Time Compliance

If samples are identified below as having been analysed or extracted outside of recommended holding times, this should be taken into consideration when interpreting results.

This report summarizes extraction / preparation and analysis times and compares each with ALS recommended holding times (referencing USEPA SW 846, APHA, AS and NEPM) based on the sample container provided. Dates reported represent first date of extraction or analysis and preclude subsequent dilutions and reruns. A listing of breaches (if any) is provided herein.

Holding time for leachate methods (e.g. TCLP) vary according to the analytes reported. Assessment compares the leach date with the shortest analyte holding time for the equivalent soil method. These are: organics 14 days, mercury 28 days & other metals 180 days. A recorded breach does not guarantee a breach for all non-volatile parameters.

Holding times for VOC in soils vary according to analytes of interest. Vinyl Chloride and Styrene holding time is 7 days; others 14 days. A recorded breach does not guarantee a breach for all VOC analytes and should be verified in case the reported breach is a false positive or Vinyl Chloride and Styrene are not key analytes of interest/concern.

Matrix: **SOIL** Evaluation: ♦ = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)		Sample Date	Extraction / Preparation			Analysis		
			Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EA001: pH in soil using 0.01M CaCl extract								
Soil Glass Jar - Unpreserved (EA001)								
BH01 1.5-1.6,	BH02 0.2-0.3,	24-Feb-2021	03-Mar-2021	03-Mar-2021	✓	03-Mar-2021	03-Mar-2021	✓
BH04 0.2-0.3,	BH04 0.4-0.5,							
BH05 0.2-0.3,	Dup							
EA055: Moisture Content (Dried @ 105-110°C)								
Soil Glass Jar - Unpreserved (EA055)								
BH01 0.2-0.3,	BH01 0.8-0.9,	24-Feb-2021	---	---	---	03-Mar-2021	10-Mar-2021	✓
BH01 1.5-1.6,	BH02 0.2-0.3,							
BH02 1.0-1.2,	BH03 0.2-0.3,							
BH03 0.8-0.9,	BH04 0.2-0.3,							
BH04 0.4-0.5,	BH05 0.2-0.3,							
Dup								
EG005(ED093)T: Total Metals by ICP-AES								
Soil Glass Jar - Unpreserved (EG005T)								
BH01 0.2-0.3,	BH01 0.8-0.9,	24-Feb-2021	03-Mar-2021	23-Aug-2021	✓	03-Mar-2021	23-Aug-2021	✓
BH01 1.5-1.6,	BH02 0.2-0.3,							
BH02 1.0-1.2,	BH03 0.2-0.3,							
BH03 0.8-0.9,	BH04 0.2-0.3,							
BH04 0.4-0.5,	BH05 0.2-0.3,							
Dup								

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Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Matrix: SOIL — Evaluation: ■ = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample IDs	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EG035T: Total Recoverable Mercury by FIMS							
Soil Glass Jar - Unpreserved (EG035T)							
BH01 0.2-0.3, BH01 1.5-1.6, BH02 1.0-1.2, BH03 0.8-0.9, BH04 0.4-0.5, Dup / BH01 0.8-0.9, BH02 0.2-0.3, BH03 0.2-0.3, BH04 0.2-0.3, BH05 0.2-0.3,	24-Feb-2021	03-Mar-2021	24-Mar-2021	✓	04-Mar-2021	24-Mar-2021	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Soil Glass Jar - Unpreserved (EP075(SIM))							
BH01 0.2-0.3, BH01 1.5-1.6, BH02 1.0-1.2, BH03 0.8-0.9, BH04 0.4-0.5, Dup / BH01 0.8-0.9, BH02 0.2-0.3, BH03 0.2-0.3, BH04 0.2-0.3, BH05 0.2-0.3,	24-Feb-2021	02-Mar-2021	10-Mar-2021	✓	02-Mar-2021	11-Apr-2021	✓
EP080/071: Total Petroleum Hydrocarbons							
Soil Glass Jar - Unpreserved (EP080)							
BH01 0.2-0.3, BH01 1.5-1.6, BH02 1.0-1.2, BH03 0.8-0.9, BH04 0.4-0.5, Dup / BH01 0.8-0.9, BH02 0.2-0.3, BH03 0.2-0.3, BH04 0.2-0.3, BH05 0.2-0.3,	24-Feb-2021	01-Mar-2021	10-Mar-2021	✓	03-Mar-2021	10-Mar-2021	✓
Soil Glass Jar - Unpreserved (EP071)							
BH01 0.2-0.3, BH01 1.5-1.6, BH02 1.0-1.2, BH03 0.8-0.9, BH04 0.4-0.5, Dup / BH01 0.8-0.9, BH02 0.2-0.3, BH03 0.2-0.3, BH04 0.2-0.3, BH05 0.2-0.3,	24-Feb-2021	02-Mar-2021	10-Mar-2021	✓	02-Mar-2021	11-Apr-2021	✓

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Matrix: SOIL — Evaluation: ■ = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample IDs	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Soil Glass Jar - Unpreserved (EP080)							
BH01 0.2-0.3, BH01 1.5-1.6, BH02 1.0-1.2, BH03 0.8-0.9, BH04 0.4-0.5, Dup / BH01 0.8-0.9, BH02 0.2-0.3, BH03 0.2-0.3, BH04 0.2-0.3, BH05 0.2-0.3,	24-Feb-2021	01-Mar-2021	10-Mar-2021	✓	03-Mar-2021	10-Mar-2021	✓
Soil Glass Jar - Unpreserved (EP071)							
BH01 0.2-0.3, BH01 1.5-1.6, BH02 1.0-1.2, BH03 0.8-0.9, BH04 0.4-0.5, Dup / BH01 0.8-0.9, BH02 0.2-0.3, BH03 0.2-0.3, BH04 0.2-0.3, BH05 0.2-0.3,	24-Feb-2021	02-Mar-2021	10-Mar-2021	✓	02-Mar-2021	11-Apr-2021	✓
EP080: BTEXN							
Soil Glass Jar - Unpreserved (EP080)							
BH01 0.2-0.3, BH01 1.5-1.6, BH02 1.0-1.2, BH03 0.8-0.9, BH04 0.4-0.5, Dup / BH01 0.8-0.9, BH02 0.2-0.3, BH03 0.2-0.3, BH04 0.2-0.3, BH05 0.2-0.3,	24-Feb-2021	01-Mar-2021	10-Mar-2021	✓	03-Mar-2021	10-Mar-2021	✓

Matrix: WATER — Evaluation: ■ = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample IDs	Sample Date	Extraction / Preparation: Date extracted	Due for extraction	Evaluation	Analysis: Date analysed	Due for analysis	Evaluation
EG020F: Dissolved Metals by ICP-MS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG020A-F)							
Rinsate	24-Feb-2021	---	---	---	03-Mar-2021	23-Aug-2021	✓
EG035F: Dissolved Mercury by FIMS							
Clear Plastic Bottle - Filtered; Lab-acidified (EG035F)							
Rinsate	24-Feb-2021	---	---	---	03-Mar-2021	24-Mar-2021	✓
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP075(SIM))							
Rinsate	24-Feb-2021	03-Mar-2021	03-Mar-2021	✓	03-Mar-2021	12-Apr-2021	✓
EP080/071: Total Petroleum Hydrocarbons							
Amber Glass Bottle - Unpreserved (EP071)							
Rinsate	24-Feb-2021	03-Mar-2021	03-Mar-2021	✓	03-Mar-2021	12-Apr-2021	✓
Amber VOC Vial - Sulfuric Acid (EP080)							
Rinsate	24-Feb-2021	01-Mar-2021	10-Mar-2021	✓	03-Mar-2021	10-Mar-2021	✓

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Matrix: **WATER** Evaluation: ♦ = Holding time breach ; ✓ = Within holding time.

Method / Container / Client Sample ID(s)	Sample Date	Extraction / Preparation			Analysis		
		Date extracted	Due for extraction	Evaluation	Date analysed	Due for analysis	Evaluation
EP068/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions							
Amber Glass Bottle - Unpreserved (EP071)							
Rinsate	24-Feb-2021	03-Mar-2021	03-Mar-2021	✓	03-Mar-2021	12-Apr-2021	✓
Amber VOC Vial - Sulfuric Acid (EP068)							
Rinsate	24-Feb-2021	01-Mar-2021	10-Mar-2021	✓	01-Mar-2021	10-Mar-2021	✓
EP068: BTEXN							
Amber VOC Vial - Sulfuric Acid (EP068)							
Rinsate	24-Feb-2021	01-Mar-2021	10-Mar-2021	✓	01-Mar-2021	10-Mar-2021	✓

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Quality Control Parameter Frequency Compliance

The following report summarises the frequency of laboratory QC samples analysed within the analytical lot(s) in which the submitted sample(s) was(were) processed. Actual rate should be greater than or equal to the expected rate. A listing of breaches is provided in the Summary of Outliers.

Matrix: **SOIL** Evaluation: ♦ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type / Analytical Methods	Method	Count		Rate (%)		Evaluation	Quality Control Specification
		QC	Regular	Actual	Expected		
Laboratory Duplicates (DUP)							
Moisture Content	EA055	2	19	10.53	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (SIM)	EP075(SIM)	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
pH in soil using a 0.01M CaCl2 extract	EA001	4	40	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	2	18	11.11	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
PAH/Phenols (SIM)	EP075(SIM)	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Mercury by FIMS	EG035T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Total Metals by ICP-AES	EG005T	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	18	5.56	5.00	✓	NEPM 2013 B3 & ALS QC Standard

Matrix: **WATER** Evaluation: ♦ = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type / Analytical Methods	Method	Count		Rate (%)		Evaluation	Quality Control Specification
		QC	Regular	Actual	Expected		
Laboratory Duplicates (DUP)							
Dissolved Mercury by FIMS	EG035F	2	13	15.38	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	2	20	10.00	10.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	7	14.29	10.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	17	0.00	10.00	♦	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	3	14	21.43	10.00	✓	NEPM 2013 B3 & ALS QC Standard
Laboratory Control Samples (LCS)							

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Matrix: **WATER** Evaluation: × = Quality Control frequency not within specification ; ✓ = Quality Control frequency within specification.

Quality Control Sample Type		Count		Rate (%)			Quality Control Specification
Analytical Methods	Method	QC	Regular	Actual	Expected	Evaluation	
Laboratory Control Samples (LCS) - Continued							
Dissolved Mercury by FIMS	EG035F	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Method Blanks (MB)							
Dissolved Mercury by FIMS	EG035F	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	1	17	5.88	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Matrix Spikes (MS)							
Dissolved Mercury by FIMS	EG035F	1	13	7.69	5.00	✓	NEPM 2013 B3 & ALS QC Standard
Dissolved Metals by ICP-MS - Suite A	EG020A-F	1	20	5.00	5.00	✓	NEPM 2013 B3 & ALS QC Standard
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	1	7	14.29	5.00	✓	NEPM 2013 B3 & ALS QC Standard
TRH - Semivolatile Fraction	EP071	0	17	0.00	5.00	×	NEPM 2013 B3 & ALS QC Standard
TRH Volatiles/BTEX	EP080	1	14	7.14	5.00	✓	NEPM 2013 B3 & ALS QC Standard

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Brief Method Summaries

The analytical procedures used by the Environmental Division have been developed from established internationally recognized procedures such as those published by the US EPA, APHA, AS and NEPM. In house developed procedures are employed in the absence of documented standards or by client request. The following report provides brief descriptions of the analytical procedures employed for results reported in the Certificate of Analysis. Sources from which ALS methods have been developed are provided within the Method Descriptions.

Analytical Methods	Method	Matrix	Method Descriptions
pH in soil using a 0.01M CaCl2 extract	EA001	SOIL	In house: Referenced to Rayment and Lyons 4B3 (mod.) or 4B4 (mod.) 10 g of soil is mixed with 50 mL of 0.01M CaCl2 and tumbled end over end for 1 hour. pH is measured from the continuous suspension. This method is compliant with NEPM Schedule B(3).
Moisture Content	EA055	SOIL	In house: A gravimetric procedure based on weight loss over a 12 hour drying period at 105-110 degrees C. This method is compliant with NEPM Schedule B(3).
Total Metals by ICP-AES	EG005T	SOIL	In house: Referenced to APHA 3120; USEPA SW 846 - 6010. Metals are determined following an appropriate acid digestion of the soil. The ICP/AES technique ionises samples in a plasma, emitting a characteristic spectrum based on metals present. Intensities at selected wavelengths are compared against those of matrix matched standards. This method is compliant with NEPM Schedule B(3)
Total Mercury by FIMS	EG035T	SOIL	In house: Referenced to AS 3550; APHA 3112 Hg - B (Flow-injection (SnCl2) (Cold Vapour generation) AAS) FIM-AAS is an automated flameless atomic absorption technique. Mercury in solids are determined following an appropriate acid digestion. Ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3)
TRH - Semivolatile Fraction	EP071	SOIL	In house: Referenced to USEPA SW 846 - 8015 Sample extracts are analysed by Capillary GC/FID and quantified against alkane standards over the range C10 - C40. Compliant with NEPM Schedule B(3).
PAH/Phenols (SIM)	EP075(SIM)	SOIL	In house: Referenced to USEPA SW 846 - 8270. Extracts are analysed by Capillary GC/MS in Selective Ion Mode (SIM) and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3)
TRH Volatiles/BTEX	EP080	SOIL	In house: Referenced to USEPA SW 846 - 8260. Extracts are analysed by Purge and Trap, Capillary GC/MS. Quantification is by comparison against an established 5 point calibration curve. Compliant with NEPM Schedule B(3) amended.
Dissolved Metals by ICP-MS - Suite A	EG020A-F	WATER	In house: Referenced to APHA 3125; USEPA SW846 - 6020, ALS QWI-EN/EG020. Samples are 0.45µm filtered prior to analysis. The ICPMS technique utilizes a highly efficient argon plasma to ionize selected elements. Ions are then passed into a high vacuum mass spectrometer, which separates the analytes based on their distinct mass to charge ratios prior to their measurement by a discrete dynode ion detector.
Dissolved Mercury by FIMS	EG035F	WATER	In house: Referenced to AS 3550; APHA 3112 Hg - B (Flow-injection (SnCl2)(Cold Vapour generation) AAS) Samples are 0.45µm filtered prior to analysis. FIM-AAS is an automated flameless atomic absorption technique. A bromate/bromide reagent is used to oxidise any organic mercury compounds in the filtered sample. The ionic mercury is reduced online to atomic mercury vapour by SnCl2 which is then purged into a heated quartz cell. Quantification is by comparing absorbance against a calibration curve. This method is compliant with NEPM Schedule B(3).
TRH - Semivolatile Fraction	EP071	WATER	In house: Referenced to USEPA SW 846 - 8015 The sample extract is analysed by Capillary GC/FID and quantification is by comparison against an established 5 point calibration curve of n-Alkane standards. This method is compliant with the QC requirements of NEPM Schedule B(3)

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Analytical Methods	Method	Matrix	Method Descriptions
PAH/Phenols (GC/MS - SIM)	EP075(SIM)	WATER	In house: Referenced to USEPA SW 846 - 8270. Sample extracts are analysed by Capillary GC/MS in SIM Mode and quantification is by comparison against an established 5 point calibration curve. This method is compliant with NEPM Schedule B(3).
TRH Volatiles/BTEX	EP080	WATER	In house: Referenced to USEPA SW 846 - 8260. Water samples are directly purged prior to analysis by Capillary GC/MS and quantification is by comparison against an established 5 point calibration curve. Alternatively, a sample is equilibrated in a headspace vial and a portion of the headspace determined by GC/MS analysis. This method is compliant with the QC requirements of NEPM Schedule B(3)

Preparation Methods	Method	Matrix	Method Descriptions
pH in soil using a 0.01M CaCl2 extract	EA001-PR	SOIL	In house: Referenced to Rayment and Lyons 4B1. 10 g of soil is mixed with 50 mL of 0.01M CaCl2 and tumbled end over end for 1 hour. pH is measured from the continuous suspension. This method is compliant with NEPM Schedule B(3).
Hot Block Digest for metals in soils sediments and sludges	EN69	SOIL	In house: Referenced to USEPA 200.2. Hot Block Acid Digestion. 1.0g of sample is heated with Nitric and Hydrochloric acids, then cooled. Peroxide is added and samples heated and cooled again before being filtered and bulked to volume for analysis. Digest is appropriate for determination of selected metals in sludge, sediments, and soils. This method is compliant with NEPM Schedule B(3).
Methanolic Extraction of Soils for Purge and Trap	ORG16	SOIL	In house: Referenced to USEPA SW 846 - 5030A. 5g of solid is shaken with surrogate and 10mL methanol prior to analysis by Purge and Trap - GC/MS.
Tumbler Extraction of Solids	ORG17	SOIL	In house: Mechanical agitation (tumbler). 10g of sample, Na2SO4 and surrogate are extracted with 30mL 1:1 DCM/Acetone by end over end tumble. The solvent is decanted, dehydrated and concentrated (by KD) to the desired volume for analysis.
Separatory Funnel Extraction of Liquids	ORG14	WATER	In house: Referenced to USEPA SW 846 - 3510. 100 mL to 1L of sample is transferred to a separatory funnel and serially extracted three times using DCM for each extract. The resultant extracts are combined, dehydrated and concentrated for analysis. This method is compliant with NEPM Schedule B(3). ALS default excludes sediment which may be resident in the container.
Volatiles Water Preparation	ORG16-W	WATER	A 5 mL aliquot or 5 mL of a diluted sample is added to a 40 mL VOC vial for purging.

Appendix 7 Borehole Logs

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Vacant Land Investigation ESA
CLIENT: Communities Tasmania

Log of BH01

EASTING: GDA94
NORTHING: GDA94
BORING LOCATION: Goodwood & Howard Roads
ELEVATION AND DATUM: 6.6 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L
TOTAL DEPTH (m): 1.6
EQUIPMENT/METHOD: Hand Auger
LOGGED BY: M Downie
NATURAL (m):
WATER TABLE (m): not e

SAMPLING:
DATE: 24/02/2021

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	CLAY: dry dark brown clay, some few intermittent weathered and unweathered gravel & rock, disturbed in appearance. located on mound.	FILL	CH	BH01 0.2-0.3	n/a	1 1 1 1 2 1 1 1 2 1 2 1 1 1 1 1 1 1 1 1 1 1 1		6.4
0.2								
0.3								
0.4								6.2
0.5								
0.6								6.0
0.7								
0.8				BH01 0.8-0.9	n/a	1 1 1 1 2 1 1 1 2 1 1 1 2 1 1 1 1 1 1 1 1		5.8
0.9								
1.0								5.6
1.1								
1.2								5.4
1.3								
1.4								5.2
1.5				BH01 1.5-1.6	n/a	1 1 1 1 2 1 1 1 2 1 2 1 1 1 1 1 1 1 1 1 1 1 1		5.0

Tas EPA IB105 CLASSIFICATION: ☐ Level 1 ☐ 2 Level 2; ☐ 3 Level 3; ☐ 4 Level 4 SAMPLE IN EXCAVATION ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Vacant Land Investigation ESA

CLIENT: Communities Tasmania

Log of BH02

EASTING: GDA94

NORTHING: GDA94

BORING LOCATION: Goodwood & Howard Roads

ELEVATION AND DATUM: 6.6 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions P/L

TOTAL DEPTH (m): 1.2

EQUIPMENT/METHOD: Hand Auger

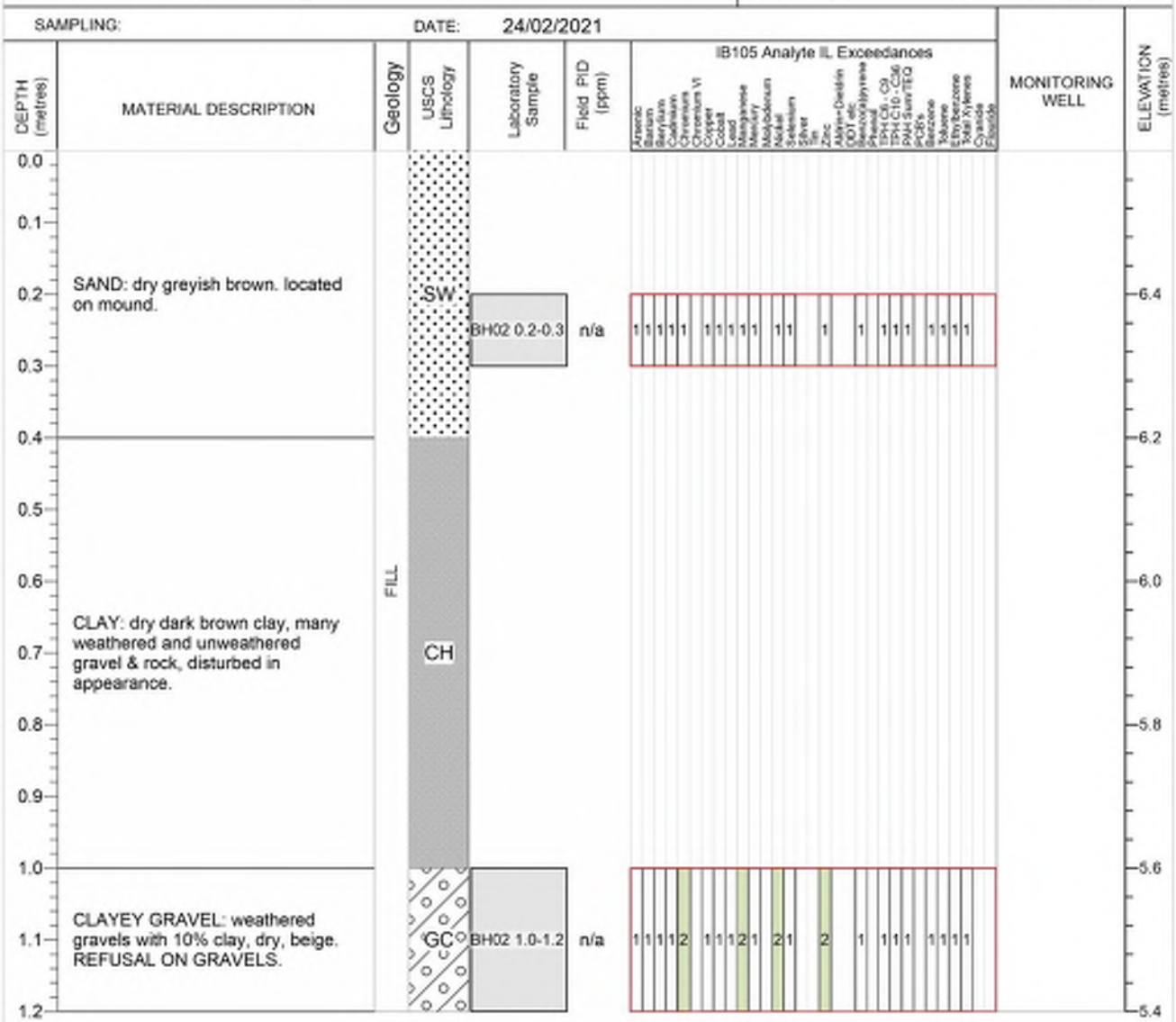
LOGGED BY: M Downie

NATURAL (m):

WATER TABLE (m): not e

SAMPLING:

DATE: 24/02/2021



Tas EPA IB105 CLASSIFICATION: ☐ Level 1 ☐ Level 2; ☐ Level 3; ☐ Level 4 SAMPLE IN EXCAVATION ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Vacant Land Investigation ESA

CLIENT: Communities Tasmania

Log of BH03

EASTING: GDA94

NORTHING: GDA94

BORING LOCATION: Goodwood & Howard Roads

ELEVATION AND DATUM: 6.3 m AHD

DRILLING CONTRACTOR: Geo-Environmental Solutions P/L

TOTAL DEPTH (m): 0.9

EQUIPMENT/METHOD: Hand Auger

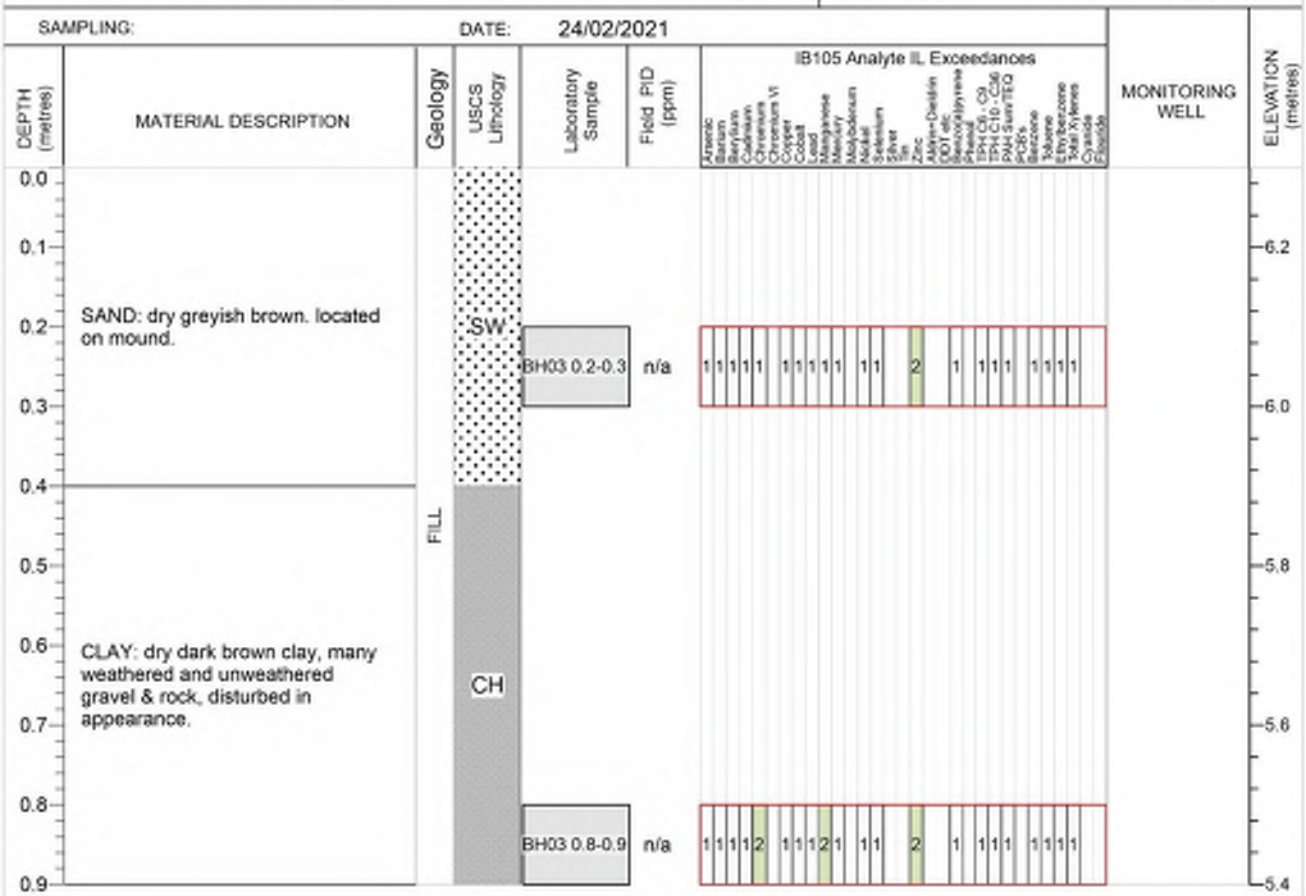
LOGGED BY: M Downie

NATURAL (m):

WATER TABLE (m): not e

SAMPLING:

DATE: 24/02/2021



Tas EPA IB105 CLASSIFICATION: Level 1 Level 2; Level 3; Level 4 SAMPLE IN EXCAVATION APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Vacant Land Investigation ESA

CLIENT: Communities Tasmania

Log of BH04

EASTING:	GDA94
NORTHING:	GDA94
BORING LOCATION: Goodwood & Howard Roads	ELEVATION AND DATUM: 5 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 0.5
EQUIPMENT/METHOD: Hand Auger	LOGGED BY: M Downie
	NATURAL (m): WATER TABLE (m): not e

SAMPLING: DATE: 24/02/2021

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0	SAND: dry greyish brown. located on flat	FILL	SW					4.8
0.2	CLAY: grey/ dark olive brown clay slightly moist, stiff, fine weathered dolerite gravel, common loose rock. REFUSAL ON LOOSE ROCK.		CH	BH04 0.2-0.3	n/a	1 1 1 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		4.6
0.5				BH04 0.4-0.5	n/a	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		

Tas EPA IB105 CLASSIFICATION: ☐ Level 1 2 Level 2; 3 Level 3; 4 Level 4 SAMPLE IN EXCAVATION ✕ APPROXIMATE GROUNDFLOOR LEVEL

GES GEO-ENVIRONMENTAL SOLUTIONS

PROJECT: Vacant Land Investigation ESA

CLIENT: Communities Tasmania

Log of BH05

EASTING:	GDA94
NORTHING:	GDA94
BORING LOCATION: Goodwood & Howard Roads	ELEVATION AND DATUM: 5 m AHD
DRILLING CONTRACTOR: Geo-Environmental Solutions P/L	TOTAL DEPTH (m): 0.3
EQUIPMENT/METHOD: Hand Auger	LOGGED BY: M Downie
	NATURAL (m): WATER TABLE (m): not e

SAMPLING: DATE: 24/02/2021

DEPTH (metres)	MATERIAL DESCRIPTION	Geology	USCS Lithology	Laboratory Sample	Field PID (ppm)	IB105 Analyte IL Exceedances	MONITORING WELL	ELEVATION (metres)
0.0								
0.1	SAND: dry greyish brown. located on flat	FILL	SW					
0.2	CLAY: dry dark brown clay, many weathered and unweathered gravel & rock, disturbed in appearance. REFUSAL ON LOOSE ROCK.		CH	BH05 0.2-0.3	n/a	1 1 1 1 1 1 1 2 1 1 1 1 1 1 1 1 1 1 1 1 1		4.8

Tas EPA IB105 CLASSIFICATION: ☐ Level 1 ☐ Level 2; ☐ Level 3; ☐ Level 4 SAMPLE IN EXCAVATION ✕ APPROXIMATE GROUNDFLOOR LEVEL

Appendix 8 Certificate of Analysis

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EM2103194**	Page	: 1 of 15
Client	: **GEO-ENVIRONMENTAL SOLUTIONS**	Laboratory	: Environmental Division Melbourne
Contact	: DR JOHN PAUL CUMMING	Contact	: Peter Ravlic
Address	: 29 KIRKSWAY PLACE BATTERY POINT TASMANIA, AUSTRALIA 7004	Address	: 4 Westall Rd Springvale VIC Australia 3171
Telephone	: +61 03 6223 1839	Telephone	: +61385499645
Project	: G Wood	Date Samples Received	: 26-Feb-2021 22:35
Order number	: ----	Date Analysis Commenced	: 01-Mar-2021
C-O-C number	: ----	Issue Date	: 04-Mar-2021 14:47
Sampler	: MD, SJ		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 13		
No. of samples analysed	: 12		

ilac-MRA NATA Accreditation No. 825 Accredited for compliance with ISO/IEC 17025 - Testing

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results
- Surrogate Control Limits

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	Position	Accreditation Category
Arenie Vijayaratnam	Non-Metals Team Leader	Melbourne Inorganics, Springvale, VIC
Dilani Fernando	Senior Inorganic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Inorganics, Springvale, VIC
Nancy Wang	2IC Organic Chemist	Melbourne Organics, Springvale, VIC
Nikki Stepniewski	Senior Inorganic Instrument Chemist	Melbourne Inorganics, Springvale, VIC

RIGHT SOLUTIONS | RIGHT PARTNER

ALS

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key: CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- EP075 (SIM): Where reported, Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(e)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero.
- Benzo(a)pyrene Toxicity Equivalent Quotient (TEQ) per the NEPM (2013) is the sum total of the concentration of the eight carcinogenic PAHs multiplied by their Toxicity Equivalence Factor (TEF) relative to Benzo(a)pyrene. TEF values are provided in brackets as follows: Benz(a)anthracene (0.1), Chrysene (0.01), Benzo(b+j) & Benzo(k)fluoranthene (0.1), Benzo(e)pyrene (1.0), Indeno(1.2.3.cd)pyrene (0.1), Dibenz(a.h)anthracene (1.0), Benzo(g.h.i)perylene (0.01). Less than LOR results for 'TEQ Zero' are treated as zero, for 'TEQ 1/2LOR' are treated as half the reported LOR, and for 'TEQ LOR' are treated as being equal to the reported LOR. Note: TEQ 1/2LOR and TEQ LOR will calculate as 0.6mg/Kg and 1.2mg/Kg respectively for samples with non-detects for all of the eight TEQ PAHs.
- EP080: Where reported, Total Xylenes is the sum of the reported concentrations of m&p-Xylene and o-Xylene at or above the LOR.
- EP075(SIM): Where reported, Total Cresol is the sum of the reported concentrations of 2-Methylphenol and 3- & 4-Methylphenol at or above the LOR.

Page : 3 of 15
Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH01 0.2-0.3	BH01 0.8-0.9	BH01 1.5-1.6	BH02 0.2-0.3	BH02 1.0-1.2
				Sampling date / time	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00
Compound	CAS Number	LOR	Unit		EM2103194-001	EM2103194-002	EM2103194-003	EM2103194-004	EM2103194-006
					Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl2 extract									
pH (CaCl2)	----	0.1	pH Unit		---	---	6.6	5.7	---
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		22.0	17.8	25.5	5.3	14.9
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg		180	280	280	60	120
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg		<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg		<1	2	<1	<1	2
Chromium	7440-47-3	2	mg/kg		127	63	84	8	100
Cobalt	7440-48-4	2	mg/kg		30	35	68	6	38
Copper	7440-50-8	5	mg/kg		37	30	26	6	62
Lead	7439-92-1	5	mg/kg		8	56	7	17	29
Manganese	7439-96-5	5	mg/kg		583	538	1330	201	672
Nickel	7440-02-0	2	mg/kg		122	47	97	5	138
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg		92	58	70	21	83
Zinc	7440-66-6	5	mg/kg		84	399	53	45	260
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	0.3	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo[b+j]fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5

Page : 4 of 15
Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH01 0.2-0.3	BH01 0.8-0.9	BH01 1.5-1.6	BH02 0.2-0.3	BH02 1.0-1.2
				Sampling date / time	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00
Compound	CAS Number	LOR	Unit		EM2103194-001	EM2103194-002	EM2103194-003	EM2103194-004	EM2103194-006
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		87.7	87.5	86.4	88.5	90.8

Page : 5 of 15
Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH01 0.2-0.3	BH01 0.8-0.9	BH01 1.5-1.6	BH02 0.2-0.3	BH02 1.0-1.2
				Sampling date / time	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00
Compound	CAS Number	LOR	Unit		EM2103194-001	EM2103194-002	EM2103194-003	EM2103194-004	EM2103194-006
					Result	Result	Result	Result	Result
EP075(SIM)S: Phenolic Compound Surrogates - Continued									
2-Chlorophenol-D4	93951-73-6	0.5	%		89.6	91.8	88.1	90.9	93.6
2,4,6-Tribromophenol	118-79-6	0.5	%		76.4	67.1	64.7	65.6	66.9
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		93.3	94.4	92.4	94.7	97.1
Anthracene-d10	1719-06-8	0.5	%		107	109	109	110	112
4-Terphenyl-d14	1718-51-0	0.5	%		98.3	100	98.7	101	104
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%		81.3	87.7	86.8	86.2	85.3
Toluene-D8	2037-26-5	0.2	%		88.1	93.2	91.6	84.8	95.4
4-Bromofluorobenzene	460-00-4	0.2	%		91.0	99.8	96.8	88.2	101

Page : 6 of 15
Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH03 0.2-0.3	BH03 0.8-0.9	BH04 0.2-0.3	BH04 0.4-0.5	BH05 0.2-0.3
				Sampling date / time	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00
Compound	CAS Number	LOR	Unit		EM2103194-007	EM2103194-008	EM2103194-009	EM2103194-010	EM2103194-011
					Result	Result	Result	Result	Result
EA001: pH in soil using 0.01M CaCl2 extract									
pH (CaCl2)	----	0.1	pH Unit		---	---	7.3	7.4	5.6
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%		6.4	11.7	19.3	18.6	16.7
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg		<5	<5	<5	<5	<5
Barium	7440-39-3	10	mg/kg		60	170	170	170	150
Beryllium	7440-41-7	1	mg/kg		<1	<1	<1	<1	<1
Boron	7440-42-8	50	mg/kg		<50	<50	<50	<50	<50
Cadmium	7440-43-9	1	mg/kg		2	2	<1	<1	<1
Chromium	7440-47-3	2	mg/kg		12	53	38	28	28
Cobalt	7440-48-4	2	mg/kg		8	26	28	36	29
Copper	7440-50-8	5	mg/kg		17	40	61	69	59
Lead	7439-92-1	5	mg/kg		60	70	<5	13	28
Manganese	7439-96-5	5	mg/kg		211	562	537	500	550
Nickel	7440-02-0	2	mg/kg		10	41	43	32	29
Selenium	7782-49-2	5	mg/kg		<5	<5	<5	<5	<5
Vanadium	7440-62-2	5	mg/kg		34	61	104	136	131
Zinc	7440-66-6	5	mg/kg		395	461	66	191	176
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg		<0.1	0.2	<0.1	<0.1	<0.1
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthylene	208-96-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Acenaphthene	83-32-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluorene	86-73-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Phenanthrene	85-01-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Anthracene	120-12-7	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Fluoranthene	206-44-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Pyrene	129-00-0	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benz(a)anthracene	56-55-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Chrysene	218-01-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(a)pyrene	50-32-8	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5

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Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH03 0.2-0.3	BH03 0.8-0.9	BH04 0.2-0.3	BH04 0.4-0.5	BH05 0.2-0.3
				Sampling date / time	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00
Compound	CAS Number	LOR	Unit		EM2103194-007	EM2103194-008	EM2103194-009	EM2103194-010	EM2103194-011
					Result	Result	Result	Result	Result
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Indeno(1.2.3-cd)pyrene	193-39-5	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Dibenz(a.h)anthracene	53-70-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Benzo(g.h.i)perylene	191-24-2	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg		0.6	0.6	0.6	0.6	0.6
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg		1.2	1.2	1.2	1.2	1.2
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg		<10	<10	<10	<10	<10
C10 - C14 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
C15 - C28 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
C29 - C36 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ C10 - C36 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg		<10	<10	<10	<10	<10
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg		<10	<10	<10	<10	<10
>C10 - C16 Fraction	----	50	mg/kg		<50	<50	<50	<50	<50
>C16 - C34 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
>C34 - C40 Fraction	----	100	mg/kg		<100	<100	<100	<100	<100
^ >C10 - C40 Fraction (sum)	----	50	mg/kg		<50	<50	<50	<50	<50
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg		<50	<50	<50	<50	<50
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
Toluene	108-88-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Ethylbenzene	100-41-4	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
ortho-Xylene	95-47-6	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
^ Sum of BTEX	----	0.2	mg/kg		<0.2	<0.2	<0.2	<0.2	<0.2
^ Total Xylenes	----	0.5	mg/kg		<0.5	<0.5	<0.5	<0.5	<0.5
Naphthalene	91-20-3	1	mg/kg		<1	<1	<1	<1	<1
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%		89.2	86.3	87.1	87.6	90.4

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Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	BH03 0.2-0.3	BH03 0.8-0.9	BH04 0.2-0.3	BH04 0.4-0.5	BH05 0.2-0.3
				Sampling date / time	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00	24-Feb-2021 00:00
Compound	CAS Number	LOR	Unit		EM2103194-007	EM2103194-008	EM2103194-009	EM2103194-010	EM2103194-011
					Result	Result	Result	Result	Result
EP075(SIM)S: Phenolic Compound Surrogates - Continued									
2-Chlorophenol-D4	93951-73-6	0.5	%		90.5	88.1	87.3	89.9	92.6
2.4.6-Tribromophenol	118-79-6	0.5	%		67.4	67.8	63.1	61.5	68.9
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%		96.3	94.4	92.2	92.7	96.5
Anthracene-d10	1719-06-8	0.5	%		109	108	112	112	114
4-Terphenyl-d14	1718-51-0	0.5	%		102	100	101	99.9	104
EP080S: TPH(V)/BTEX Surrogates									
1.2-Dichloroethane-D4	17060-07-0	0.2	%		89.3	84.8	81.2	86.2	91.9
Toluene-D8	2037-26-5	0.2	%		92.2	88.5	85.7	89.2	87.8
4-Bromofluorobenzene	460-00-4	0.2	%		86.6	89.3	91.8	96.3	91.1

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Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	Dup	---	---	---	---
				Sampling date / time	24-Feb-2021 00:00	---	---	---	---
Compound	CAS Number	LOR	Unit	EM2103194-012	------	------	------	------	
				Result	---	---	---	---	
EA001: pH in soil using 0.01M CaCl2 extract									
pH (CaCl2)	----	0.1	pH Unit	5.8	---	---	---	---	
EA055: Moisture Content (Dried @ 105-110°C)									
Moisture Content	----	1.0	%	4.9	---	---	---	---	
EG005(ED093)T: Total Metals by ICP-AES									
Arsenic	7440-38-2	5	mg/kg	<5	---	---	---	---	
Barium	7440-39-3	10	mg/kg	60	---	---	---	---	
Beryllium	7440-41-7	1	mg/kg	<1	---	---	---	---	
Boron	7440-42-8	50	mg/kg	<50	---	---	---	---	
Cadmium	7440-43-9	1	mg/kg	<1	---	---	---	---	
Chromium	7440-47-3	2	mg/kg	7	---	---	---	---	
Cobalt	7440-48-4	2	mg/kg	9	---	---	---	---	
Copper	7440-50-8	5	mg/kg	6	---	---	---	---	
Lead	7439-92-1	5	mg/kg	19	---	---	---	---	
Manganese	7439-96-5	5	mg/kg	322	---	---	---	---	
Nickel	7440-02-0	2	mg/kg	6	---	---	---	---	
Selenium	7782-49-2	5	mg/kg	<5	---	---	---	---	
Vanadium	7440-62-2	5	mg/kg	31	---	---	---	---	
Zinc	7440-66-6	5	mg/kg	53	---	---	---	---	
EG035T: Total Recoverable Mercury by FIMS									
Mercury	7439-97-6	0.1	mg/kg	<0.1	---	---	---	---	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	0.5	mg/kg	<0.5	---	---	---	---	
Acenaphthylene	208-96-8	0.5	mg/kg	<0.5	---	---	---	---	
Acenaphthene	83-32-9	0.5	mg/kg	<0.5	---	---	---	---	
Fluorene	86-73-7	0.5	mg/kg	<0.5	---	---	---	---	
Phenanthrene	85-01-8	0.5	mg/kg	<0.5	---	---	---	---	
Anthracene	120-12-7	0.5	mg/kg	<0.5	---	---	---	---	
Fluoranthene	206-44-0	0.5	mg/kg	<0.5	---	---	---	---	
Pyrene	129-00-0	0.5	mg/kg	<0.5	---	---	---	---	
Benz(a)anthracene	56-55-3	0.5	mg/kg	<0.5	---	---	---	---	
Chrysene	218-01-9	0.5	mg/kg	<0.5	---	---	---	---	
Benzo(b+j)fluoranthene	205-99-2 205-82-3	0.5	mg/kg	<0.5	---	---	---	---	
Benzo(k)fluoranthene	207-08-9	0.5	mg/kg	<0.5	---	---	---	---	
Benzo(a)pyrene	50-32-8	0.5	mg/kg	<0.5	---	---	---	---	

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Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	Dup	---	---	---	---
				Sampling date / time	24-Feb-2021 00:00	---	---	---	---
Compound	CAS Number	LOR	Unit	EM2103194-012	------	------	------	------	
				Result	---	---	---	---	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
Indeno(1,2,3-cd)pyrene	193-39-5	0.5	mg/kg	<0.5	---	---	---	---	
Dibenz(a,h)anthracene	53-70-3	0.5	mg/kg	<0.5	---	---	---	---	
Benzo(g,h,i)perylene	191-24-2	0.5	mg/kg	<0.5	---	---	---	---	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	mg/kg	<0.5	---	---	---	---	
^ Benzo(a)pyrene TEQ (zero)	----	0.5	mg/kg	<0.5	---	---	---	---	
^ Benzo(a)pyrene TEQ (half LOR)	----	0.5	mg/kg	0.6	---	---	---	---	
^ Benzo(a)pyrene TEQ (LOR)	----	0.5	mg/kg	1.2	---	---	---	---	
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	10	mg/kg	<10	---	---	---	---	
C10 - C14 Fraction	----	50	mg/kg	<50	---	---	---	---	
C15 - C28 Fraction	----	100	mg/kg	<100	---	---	---	---	
C29 - C36 Fraction	----	100	mg/kg	<100	---	---	---	---	
^ C10 - C36 Fraction (sum)	----	50	mg/kg	<50	---	---	---	---	
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	10	mg/kg	<10	---	---	---	---	
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	10	mg/kg	<10	---	---	---	---	
>C10 - C16 Fraction	----	50	mg/kg	<50	---	---	---	---	
>C16 - C34 Fraction	----	100	mg/kg	<100	---	---	---	---	
>C34 - C40 Fraction	----	100	mg/kg	<100	---	---	---	---	
^ >C10 - C40 Fraction (sum)	----	50	mg/kg	<50	---	---	---	---	
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	50	mg/kg	<50	---	---	---	---	
EP080: BTEXN									
Benzene	71-43-2	0.2	mg/kg	<0.2	---	---	---	---	
Toluene	108-88-3	0.5	mg/kg	<0.5	---	---	---	---	
Ethylbenzene	100-41-4	0.5	mg/kg	<0.5	---	---	---	---	
meta- & para-Xylene	108-38-3 106-42-3	0.5	mg/kg	<0.5	---	---	---	---	
ortho-Xylene	95-47-6	0.5	mg/kg	<0.5	---	---	---	---	
^ Sum of BTEX	----	0.2	mg/kg	<0.2	---	---	---	---	
^ Total Xylenes	----	0.5	mg/kg	<0.5	---	---	---	---	
Naphthalene	91-20-3	1	mg/kg	<1	---	---	---	---	
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	0.5	%	87.0	---	---	---	---	

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Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	Dup	---	---	---	---
				Sampling date / time	24-Feb-2021 00:00	---	---	---	---
Compound	CAS Number	LOR	Unit	EM2103194-012	-----	-----	-----	-----	
				Result	---	---	---	---	---
EP075(SIM)S: Phenolic Compound Surrogates - Continued									
2-Chlorophenol-D4	93951-73-6	0.5	%	88.3	---	---	---	---	
2,4,6-Tribromophenol	118-79-6	0.5	%	65.6	---	---	---	---	
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	0.5	%	90.9	---	---	---	---	
Anthracene-d10	1719-06-8	0.5	%	109	---	---	---	---	
4-Terphenyl-d14	1718-51-0	0.5	%	99.2	---	---	---	---	
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	0.2	%	80.9	---	---	---	---	
Toluene-D8	2037-26-5	0.2	%	84.2	---	---	---	---	
4-Bromofluorobenzene	460-00-4	0.2	%	88.2	---	---	---	---	

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Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Rinsate	---	---	---	---
				Sampling date / time	24-Feb-2021 00:00	---	---	---	---
Compound	CAS Number	LOR	Unit	EM2103194-013	-----	-----	-----	-----	
				Result	---	---	---	---	---
EG035F: Dissolved Metals by ICP-MS									
Arsenic	7440-38-2	0.001	mg/L	<0.001	---	---	---	---	
Boron	7440-42-8	0.05	mg/L	<0.05	---	---	---	---	
Barium	7440-39-3	0.001	mg/L	<0.001	---	---	---	---	
Beryllium	7440-41-7	0.001	mg/L	<0.001	---	---	---	---	
Cadmium	7440-43-9	0.0001	mg/L	<0.0001	---	---	---	---	
Cobalt	7440-48-4	0.001	mg/L	<0.001	---	---	---	---	
Chromium	7440-47-3	0.001	mg/L	<0.001	---	---	---	---	
Copper	7440-50-8	0.001	mg/L	<0.001	---	---	---	---	
Manganese	7439-96-5	0.001	mg/L	<0.001	---	---	---	---	
Nickel	7440-02-0	0.001	mg/L	<0.001	---	---	---	---	
Lead	7439-92-1	0.001	mg/L	<0.001	---	---	---	---	
Selenium	7782-49-2	0.01	mg/L	<0.01	---	---	---	---	
Vanadium	7440-62-2	0.01	mg/L	<0.01	---	---	---	---	
Zinc	7440-66-6	0.005	mg/L	<0.005	---	---	---	---	
EG035F: Dissolved Mercury by FIMS									
Mercury	7439-97-6	0.0001	mg/L	<0.0001	---	---	---	---	
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons									
Naphthalene	91-20-3	1.0	µg/L	<1.0	---	---	---	---	
Acenaphthylene	208-96-8	1.0	µg/L	<1.0	---	---	---	---	
Acenaphthene	83-32-9	1.0	µg/L	<1.0	---	---	---	---	
Fluorene	86-73-7	1.0	µg/L	<1.0	---	---	---	---	
Phenanthrene	85-01-8	1.0	µg/L	<1.0	---	---	---	---	
Anthracene	120-12-7	1.0	µg/L	<1.0	---	---	---	---	
Fluoranthene	206-44-0	1.0	µg/L	<1.0	---	---	---	---	
Pyrene	129-00-0	1.0	µg/L	<1.0	---	---	---	---	
Benz[a]anthracene	56-55-3	1.0	µg/L	<1.0	---	---	---	---	
Chrysene	218-01-9	1.0	µg/L	<1.0	---	---	---	---	
Benzo[b+j]fluoranthene	205-99-2 205-82-3	1.0	µg/L	<1.0	---	---	---	---	
Benzo[k]fluoranthene	207-08-9	1.0	µg/L	<1.0	---	---	---	---	
Benzo[a]pyrene	50-32-8	0.5	µg/L	<0.5	---	---	---	---	
Indeno[1,2,3-cd]pyrene	193-39-5	1.0	µg/L	<1.0	---	---	---	---	
Dibenz[a,h]anthracene	53-70-3	1.0	µg/L	<1.0	---	---	---	---	
Benzo[g,h,i]perylene	191-24-2	1.0	µg/L	<1.0	---	---	---	---	
^ Sum of polycyclic aromatic hydrocarbons	----	0.5	µg/L	<0.5	---	---	---	---	

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Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Rinsate	---	---	---	---
				Sampling date / time	24-Feb-2021 00:00	---	---	---	---
Compound	CAS Number	LOR	Unit		EM2103194-013	------	------	------	------
					Result	---	---	---	---
EP075(SIM)B: Polynuclear Aromatic Hydrocarbons - Continued									
^ Benzo(a)pyrene TEQ (zero)	----	0.5	µg/L		<0.5	---	---	---	---
EP080/071: Total Petroleum Hydrocarbons									
C6 - C9 Fraction	----	20	µg/L		<20	---	---	---	---
C10 - C14 Fraction	----	50	µg/L		<50	---	---	---	---
C15 - C28 Fraction	----	100	µg/L		<100	---	---	---	---
C29 - C36 Fraction	----	50	µg/L		<50	---	---	---	---
^ C10 - C36 Fraction (sum)	----	50	µg/L		<50	---	---	---	---
EP080/071: Total Recoverable Hydrocarbons - NEPM 2013 Fractions									
C6 - C10 Fraction	C6_C10	20	µg/L		<20	---	---	---	---
^ C6 - C10 Fraction minus BTEX (F1)	C6_C10-BTEX	20	µg/L		<20	---	---	---	---
>C10 - C16 Fraction	----	100	µg/L		<100	---	---	---	---
>C16 - C34 Fraction	----	100	µg/L		<100	---	---	---	---
>C34 - C40 Fraction	----	100	µg/L		<100	---	---	---	---
^ >C10 - C40 Fraction (sum)	----	100	µg/L		<100	---	---	---	---
^ >C10 - C16 Fraction minus Naphthalene (F2)	----	100	µg/L		<100	---	---	---	---
EP080: BTEXN									
Benzene	71-43-2	1	µg/L		<1	---	---	---	---
Toluene	108-88-3	2	µg/L		<2	---	---	---	---
Ethylbenzene	100-41-4	2	µg/L		<2	---	---	---	---
meta- & para-Xylene	108-38-3 106-42-3	2	µg/L		<2	---	---	---	---
ortho-Xylene	95-47-6	2	µg/L		<2	---	---	---	---
^ Total Xylenes	----	2	µg/L		<2	---	---	---	---
^ Sum of BTEX	----	1	µg/L		<1	---	---	---	---
Naphthalene	91-20-3	5	µg/L		<5	---	---	---	---
EP075(SIM)S: Phenolic Compound Surrogates									
Phenol-d6	13127-88-3	1.0	%		37.5	---	---	---	---
2-Chlorophenol-D4	93951-73-6	1.0	%		92.0	---	---	---	---
2,4,6-Tribromophenol	118-79-6	1.0	%		100	---	---	---	---
EP075(SIM)T: PAH Surrogates									
2-Fluorobiphenyl	321-60-8	1.0	%		99.2	---	---	---	---
Anthracene-d10	1719-06-8	1.0	%		99.3	---	---	---	---
4-Terphenyl-d14	1718-51-0	1.0	%		96.5	---	---	---	---

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Work Order : EM2103194
Client : GEO-ENVIRONMENTAL SOLUTIONS
Project : G Wood

Analytical Results

Sub-Matrix: WATER (Matrix: WATER)				Sample ID	Rinsate	---	---	---	---
				Sampling date / time	24-Feb-2021 00:00	---	---	---	---
Compound	CAS Number	LOR	Unit		EM2103194-013	------	------	------	------
					Result	---	---	---	---
EP080S: TPH(V)/BTEX Surrogates									
1,2-Dichloroethane-D4	17060-07-0	2	%		94.1	---	---	---	---
Toluene-D8	2037-26-5	2	%		94.6	---	---	---	---
4-Bromofluorobenzene	460-00-4	2	%		93.7	---	---	---	---

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Work Order	: EM2100194
Client	: GEO-ENVIRONMENTAL SOLUTIONS
Project	: G Wood

Surrogate Control Limits

Sub-Matrix: SOIL		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	54	125
2-Chlorophenol-D4	93951-73-6	65	123
2,4,6-Tribromophenol	118-79-6	34	122
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	61	125
Anthracene-d10	1719-06-8	62	130
4-Terphenyl-d14	1718-51-0	67	133
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	51	125
Toluene-D8	2037-26-5	55	125
4-Bromofluorobenzene	460-00-4	56	124

Sub-Matrix: WATER		Recovery Limits (%)	
Compound	CAS Number	Low	High
EP075(SIM)S: Phenolic Compound Surrogates			
Phenol-d6	13127-88-3	10	51
2-Chlorophenol-D4	93951-73-6	30	114
2,4,6-Tribromophenol	118-79-6	26	133
EP075(SIM)T: PAH Surrogates			
2-Fluorobiphenyl	321-60-8	35	127
Anthracene-d10	1719-06-8	44	122
4-Terphenyl-d14	1718-51-0	44	124
EP080S: TPH(V)/BTEX Surrogates			
1,2-Dichloroethane-D4	17060-07-0	73	129
Toluene-D8	2037-26-5	70	126
4-Bromofluorobenzene	460-00-4	71	129

Appendix D

Contact details of the suggested interested persons

Appendix D: Contact Details of the suggested interested persons

Property	Owner Name	Postal Address	PID	Title Reference